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A Catalogue of British Columbia Sea-bird Colonies

by

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R. H. DRENT and C. J. GUIGUET

Department of Zoology, University of British Columbia, Vancouver 8, B. C.
and
Provincial Museum, Victoria, B. C.

Issued June, 1961

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A Catalogue of British Columbia Sea-bird Colonies

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R. Drent and C. J. Guiguet

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INTRODUCTION

The nesting sea-birds of our Province are 12--two petrels, two cormorants, a gull, and seven auks. The white pelican, mew and herring gull, arctic and black tern, all being fresh-water nesters in British Columbia are here excluded; only the mew gull among them has known colonies near salt water. We here attempt to assemble the scattered information on nesting sites of these 12 species. Although roughly halved by the intrusion of the Alaska panhandle, the B. C. coastline is a 575-mile stretch encompassing just under $6\frac{1}{2}$ degrees of latitude, a rugged maze of inlets and islands. Beyond the inner southern portion, this coast is practically uninhabited, and knows only the seasonal presence of fisherman or logger; thus problems of transport and supply make adequate exploration of most areas an expensive and time-consuming undertaking. A brief sketch of the materials available to us will make clear that systematic study of sea-birds in British Columbia has but barely begun; this report is a tentative outline only.

Early work on our coast was but rarely recorded. Menzies, physician and naturalist on Vancouver's expedition, left some fascinating fragments (only 1792 journal available). Lord (1866) left no definite records, and we have been unable to locate concrete results of Forbush's 1888 work or Dawson's early visits (eg. 1896), both of these on our south coast. Osgood's report (1901) on the Queen Charlottes in 1900 is vague by present standards, and the work of Rev. J. H. Keen of Masset and Metlakahtla the north coast, and of the wide-ranging W. A. Newcombe and W. B. Burton of Victoria, as well as that of C. de Blois Green of Kaleden, is known to us only through scattered egg records. Brooks & Swarth (1925) thus had practically nothing to rely upon in preparing their summary, and could add only brief notes from Brooks' travels (especially to Langara Island in 1920).

Fortunately naturalists active since then have often left some record of their work, so that we have an idea of what Young, Darcus and Cumming found in the Queen Charlottes and Queen Charlotte Strait. Munro, though his main duties took him elsewhere, left excellent summaries of his visits to south-coast colonies, and Pearse has recorded his experiences in this region. It is unfortunate that the late T. T. McCabe never published on his extensive bird-work on the central coast. His field notes have been carefully worked over, and though important data were gained it is apparent that his notes were a cryptic guide only, and much was left to memory; this is now forever lost.

It was not until after World War II that the Provincial Museum at Victoria was in a position to undertake survey work on the coast, and results from the 1946 season in the Queen Charlottes (C. J. Guiguet, Biologist of the Museum, and Dr. I. McT. Cowan of the University of British Columbia) were available for Munro & Cowan's (1947) critical review.

Since that time Guiguet has continued the coastal exploratory work for the Museum, and has reported on a portion thereof (Goose Islands in 1948, Guiguet 1953; Scott Islands in 1949/50 Guiguet 1950 and Carl et al. 1951; Solander Island in 1954, Guiguet 1955; and Bunsby Islands in 1955, Carl & Guiguet 1956). This and his many unpublished journals (notably Queen Charlottes 1946/47 & '52) form the most extensive records of sea-bird nesting sites in British Columbia.

Finally, since its organization at the University of British Columbia in 1955, the British Columbia Nest Records Scheme (see Myres 1957 a and b, and Myres et al. 1957) has been accumulating nesting data on all birds; by now a considerable body of information on south-coast sea-bird colonies is available. These records are of particular value since date, locality, exact nature of nesting evidence, and, where possible, numbers, are at once clear; where necessary the contributor can usually be contacted for further detail. What the scheme does, is to put on file each season the tangible nest records of a whole army of naturalists.

Drent, who spent the 1959/60 seasons studying sea-birds on Mandarte Island, B. C., was impressed with data in the BCNRS files as a basis for census work on the south-coast colonies, and felt that an up-to-date summary of available information would prove a valuable impetus to further work. Accordingly he began sifting through these records and published reports, and mailed out questionnaires. Guiguet's data accumulating annually since 1946 were ear-marked for publication when the vast array of unexplored areas was more fully investigated. Drent's efforts, along with these accumulated data, at once made publication feasible. It was but natural to join efforts, and this catalogue is the outcome.

Drent acted as compiler, and prepared the text. (Where one reads "I" this refers to Drent.) Guiguet made all his findings available, going over his journals and extracting nesting records, save for the Queen Charlotte work 1946/47, where Drent had access to Guiguet's indexed journals at the Department of Zoology, University of British Columbia. Guiguet then checked the manuscript for accuracy. Likewise the "nesting habits" sections have had the benefit of his wide experience. Thus Drent is responsible for literature use, data from BCNRS files and correspondence, and compilation of maps and photographs, whilst Guiguet has made his many records freely available and has checked that they are correctly reported.

The plan is to introduce each species by a brief sketch of nesting habits, emphasizing relevant statistics such as incubation period, then to summarize breeding chronology for the Province as precisely as possible, and finally to give species and subspecies breeding ranges. The latter are drawn primarily from the A.O.U. 1957 check list (Alexander 1959 is in need of much revision on distribution) as supplemented by Gabrielson and Lincoln's (1959) work on Alaska birds; unfortunately no such critical review is available for Washington. This catalogue is primarily intended for the British Columbia reader, and it is for him that these introductory sections have been prepared; the questions we find most frequently asked are dealt with insofar as the scanty information at hand allows, and thus use of the distributional data are facilitated.

All definite records of sea-birds nesting in British Columbia known to us are then listed, in the order Queen Charlotte Islands, north coast to Queen Charlotte Strait, west coast Vancouver Island, and finally inner south coast (Strait of Georgia etc.). Many of the older records could easily have been omitted, but Drent was anxious to document the history of the various colonies so far as possible. No doubt many of our colonies have been in existence over a vast period of time, but for serious study we must have proof by written records. Those interested in distribution will therefore find the basis for all records in detail, whilst those planning work on our colonies will readily learn what previous observers have found. All colonies have been located as precisely as possible on charts of the Canadian Hydrographic Service (BCNRS chart file) whence the brief locality descriptions and co-ordinates (to nearest minute) are taken. Such treatment is essential in dealing with seabird colonies, often situated on minute islands or obscure headlands, and frequently designated ambiguously "Bare Island," "Grassy Island," "Gull Island" and the like. It is to be hoped that future workers will take unusual care in locality description and thereby avoid countless headaches later on.

Records for sites that cannot now be located are generally omitted; published reference to colonies for which we can find no basis are discussed in the "Hypotheticals" sections. The maps in this report are to be used with caution; it should be clear by now that our knowledge is scanty, and most apparent gaps indicate nothing but unknown areas. Examination of pelagic cormorant, glaucous-winged gull, and pigeon guillemot, all of which nest throughout our coastline, will demonstrate the small patches of exploration and the vast stretches still to be worked.

CREDITS

Acknowledgment of the help so many gave in the preparation of this report will be found on pages 160 to 162. The following abbreviations will be met:

PM	Provincial Museum of Natural History, Victoria, B.C.
ROM	Royal Ontario Museum, Toronto, Ontario.
UBC	University of British Columbia, Vancouver 8, B. C.
IMcTC MS	Unpublished observations of Dr. I. McT. Cowan (UBC)
CJG MS	Unpublished observations of C. J. Guiguet (PM)
WSM MS	Unpublished observations of the late W. S. Maguire (at UBC)
McCabe MS	Unpublished observations of the late T. T. McCabe (lent from Museum of Comparative Zoology, Harvard)
WSM coll.	Oological collection of the late Walter S. Maguire (at UBC)
ALM coll.	Oological collection of A. L. Meugens (New Westminster, B. C.)
BCNRS	Information on file in the B. C. Nest Records Scheme (UBC)
Q	Replies to "B. C. Sea-bird Inquiry 1960" of the Scheme
A.O.U.	American Ornithologists' Union Check list of North American birds, 5th ed.
G&L	Gabrielson & Lincoln's (1959) Birds of Alaska
M-C	Munro & Cowan's (1947) A review of the bird fauna of British Columbia
VNHS	Victoria Natural History Society

1. FORK-TAILED PETREL Oceanodroma furcata

Nesting habits (Bent 1922: 132-137)

Generally excavates a burrow in the sod (diameter 1 1/2" to 2" CJG MS), but may use natural cavities (Murie 1959: 50) for nesting. Here mating takes place and the single white egg deposited, with sometimes a bit of dry grass as nest material (G&L: 82). The chick is fed in the burrow until fully feathered and ready to begin life independent of the parents; it may in fact be abandoned by the adults for the last few days (see next species). This petrel is completely nocturnal on the breeding grounds, changing of the guard during incubation and later feeding of the chick taking place by spectacular mass flights by dark when the otherwise silent and immobile colony comes to life. No detailed life history is yet available.

Season (Cox Island)

The first eggs must be laid about mid-April, judging from downy young May 31 1947, June 6 1946, June 7 1947; latest definite date for fresh eggs June 7 1952 (3). Young hatch from the close of May onwards, and the majority apparently leave the burrow in August.

Species breeding range (A.O.U. 1957: 20-21)

Kuriles, Commander Islands, and Aleutians through southern Alaska, British Columbia, Washington, and Oregon to northern California. A North Pacific bird with centre of distribution in the Aleutians (Murie 1959: 50).

Subspecies breeding range O. f. plumbea

From Alexander Archipelago in Alaska (the "panhandle," with two known sites, St. Lazaria and Forrester Islands, G&L: 89) south to islets off Washington (one known site, Bodelteh Islands, Clallam Cty., Richardson 1960), Oregon, and northern California (Del Norte & Humboldt Cties).

British Columbia sites

Often nesting in company with Leach petrel; scattered sites open coast islets throughout coastline.

Fig. 1.

June 7, 1952. G. C. Carl. Cox Island, QCI. Fork-tailed petrel: burrow broken open, incubating adult lifted from egg (note crack; close to hatching).

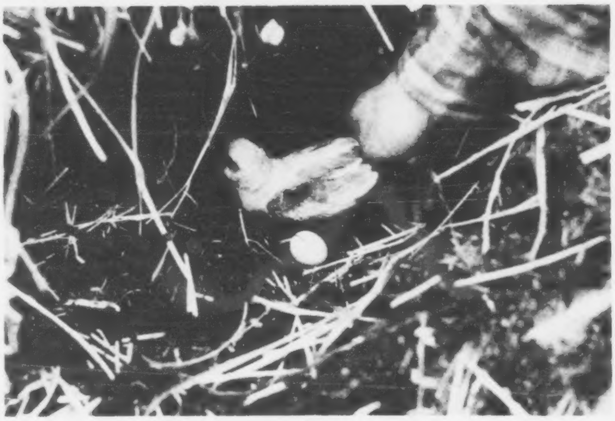


Fig. 2.

June 7, 1952. G. C. Carl. Cox Island, QCI. Fork-tailed petrel: adult taken from burrow; pearly grey colour diagnostic. Note small size --slightly less than robin.

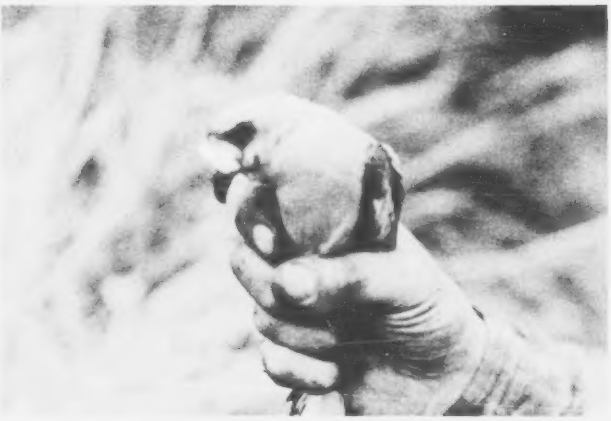
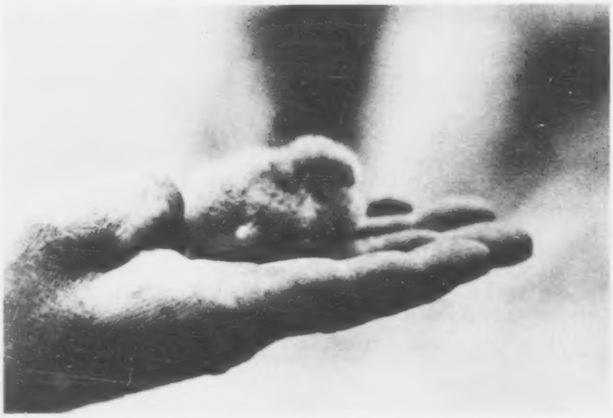


Fig. 3.

June 7, 1952. G. C. Carl. Cox Island, QCI. Fork-tailed petrel: downy young; note wing stub. The first chicks were hatching this date.



LANGARA ISLAND, QCI (old name North Island) off NW tip Graham Island, Iphigenia Pt. area: whole promontory W Henslung Cove, 54°11'-12' N, 133°00'-01' W.

1952, May 15. Nesting in all grassy areas here; burrows excavated held eggs, ranging from fresh to embryos (CJG MS).

COX ISLAND, QCI, Cloak Bay, SW shore Langara Island. 54°12'N, 133°01' W.

1920, July 22. The islet in Cloak Bay where Brooks reported nesting this date (Brooks & Swarth 1925) is undoubtedly Cox. Details of what he found are lacking.

1927, May 14. Darcus (1927) gave Cox as a nesting ground in 1927, and recorded taking the first egg this date, locality unstated but probably Cox (Darcus 1930).

May 21. Darcus definitely took 5 eggs here this date (4 ROM, 1 WSM coll., ad. in the burrow); these make the May 14 record almost certain.

1930, July. Cumming (1930) collected adults, downy young, and eggs from the burrows here.

1946, May 27. C. J. Guiguet & R. M. Stewart collected 8 incubating adults (6m & 2f), each on a single egg; the eggs were likewise collected (CJG MS).

June 6. 1 male with 1 well-incubated egg, and 1 female with a small downy young collected (CJG MS).

July 6. 6 incubating adults and 6 eggs collected (CJG MS).

1947, May 13. 24 eggs, ranging from fresh to well incubated, were excavated, each apparently brooded by 1 parent (CJG MS). 14 of these eggs (3 fresh, 5 well incubated, others intermediate) in WSM coll.

May 31. Downy young excavated (CJG MS), and 5 eggs, far advanced, in WSM coll.

July 4. Very few eggs, some abandoned, a couple highly incubated; most of the burrows with large downy young (CJG MS).

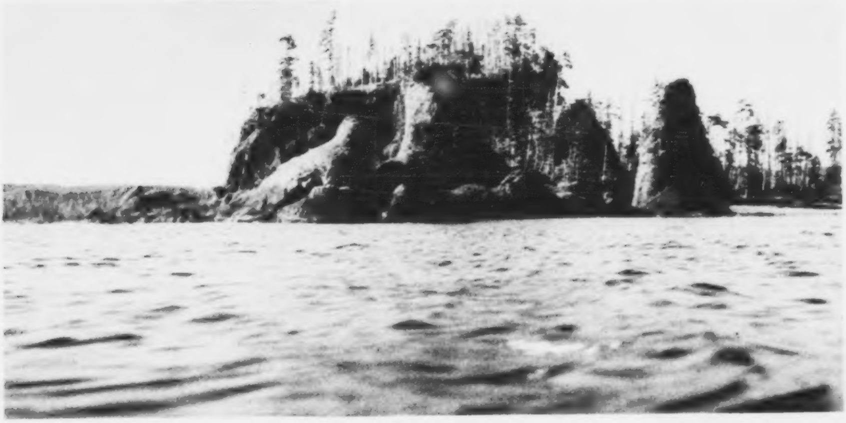


Fig. 4.

Cox Island, Cloak Bay, QCI. June 1946. C. J. Guiguet. Nesting site of fork-tailed & Leach petrel, pelagic cormorant, glaucous-winged gull, ancient murrelet, Cassin auklet, and tufted puffin. Famous for unconfirmed reports of marbled murrelets nesting. Langara Island in the background.

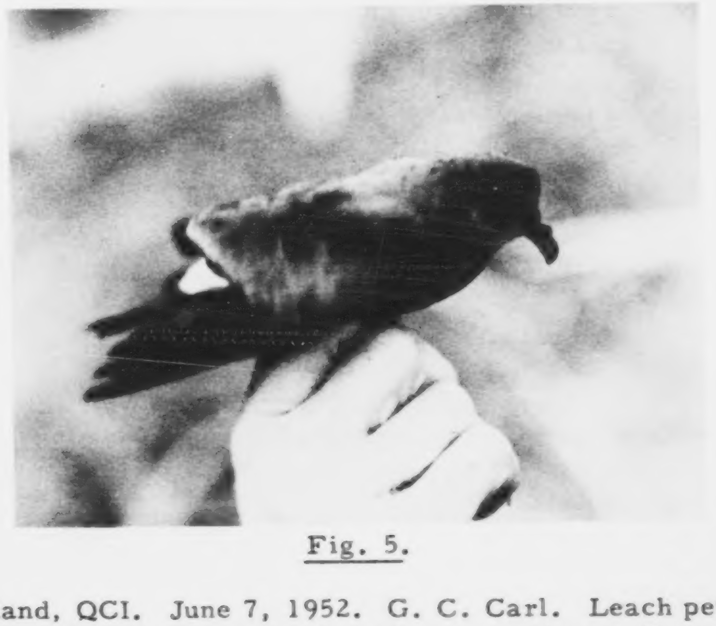


Fig. 5.

Cox Island, QCI. June 7, 1952. G. C. Carl. Leach petrel: adult taken from burrow; about same size as fork-tailed, but black. Distinguished from other dark petrels by conspicuous white rump-patch, shown here. Note tubular nostrils atop bill, characteristic for group. Bird fanning wings in effort to escape.

1947, August 18. Juveniles ready to fly; 1 (female) collected (CJG MS).

1952, May 13. Burrows excavated: Most nests freshly prepared but unoccupied; 2 had eggs: 1 fresh, 1 with advanced embryo (CJG MS).

June 7. 15 burrows uncovered, several others by F. L. Beebe; of these 1 held downy young just hatched (collected); most others had adult on egg; most eggs well incubated, 2 actually pipping; 3 perfectly fresh, and 4 cold and abandoned. (CJG MS).

TIAN ISLETS, QCI, E Tian Head, forming W boundary Tian Bay, central W coast Graham Island. N islet: 53°46' N, 133°05' W; S islet: 53°45' N, 133°05' W.

1947, July 7. 1 large downy young excavated on the north islet (CJG MS).

OGILVIE ISLAND, QCI, W Louis Pt., E Port Louis, W central coast Graham Island. 53°41' N, 132°59' W.

1947, July 7. This colony was badly disturbed by marauding black bear, but 2 young and 1 adult were collected (CJG MS).

QUEEN ISLAND, QCI, in Port Louis, 53°42' N, 132°57' W.

1947, July 8. Large colony discovered, again 90% destroyed by black bear; identification by adult remains (CJG MS).

FINGAL ISLAND, McMullin Group, between Goose Island and Princess Alice Island, 128°28' N, 52°05' W.

1948, August 4. Small colony here (Guiguet 1953); 6 burrows were excavated; 1 held a small downy young (collected, now in UBC Museum), others empty, young presumably flown (CJG MS).

TRIANGLE ISLAND, outermost of the Scott Islands lying W Cape Scott, N tip Vancouver Island, 50°52' N, 129°05' W.

1909, July 20. 1 egg collected by W. Burton (PM).

1949, June 24-July 1. The Museum party found no sure evidence of nesting (disused petrel burrows only), but taking into account the rugged terrain and short time available, consider present-day nesting here probable (Carl et al. 1951).

CLELAND ISLAND (called Bare), W Vargas Island, S Brabant Channel, Clayoquot Sound, central W coast Vancouver I., 49°10' N, 126°05' W.

1925, June 14. 1 egg collected by S. J. Darcus in ROM.

1930, May 9. Petrel burrows noted all over the island; birds had not yet returned so species unsure (IMcTC MS); confirmation for present nesting required.

2. LEACH PETREL (Beal's or Boreal) Oceanodroma leucorhoa

Nesting habits

An excellent life history study on this petrel in the Bay of Fundy provides detail (Gross 1935). The male takes the larger share in digging the burrow (a new one may take 3 days to complete), the entrance averaging 2 1/2" by 3 1/4", and the 20" long shaft terminating in a chamber about 6 × 6 × 3" (averages from 40 burrows). In this end cavity mating occurs, and the single white egg is laid, either with or without grasses, twigs, etc., dragged in from the surroundings. The parents incubate by turns, each shift being about 4 days (longest record 6 days). As in the other petrel, all movements to and from the colony go on under cover of night. The egg hatches in about 50 days, and the chick is brooded by one of the parents until 5 days old; it is then left alone, but continues to be fed at night until fully feathered. It is probably abandoned by the parents to fast for the last few days (Fisher & Lockley 1954: 192). The chicks leave the burrow at about 70 days, to take up an independent existence.

Season in British Columbia

A later nester than the preceding; egg-laying 2 weeks later than furcata (Cummings 1930), about 1 month later (Darcus 1930), 6 weeks later (Maguire MS). Probably Maguire is closest, as the 1946-47 QCI data on which he based the estimate are more extensive than that of the other observers. Most eggs are laid from mid-June (none June 6, 1946, June 7, 1952; earliest June 17, 1946) to July (latest definite date August 18, 1947); the first young cannot leave the burrow before October therefore.

Species breeding range (AOU 1957: 21-22)

Northern Japan, Kuriles, Commander Islands and Aleutians (where it is much less numerous than furcata, Murie 1959: 51), south along Pacific coast to off Baja California; in Atlantic from southern Labrador to Massachusetts, and from Iceland and the Faeroes south to islets NW of the U.K.

Subspecies breeding range (O. l. beali)

Offshore islets from Alexander Archipelago in Alaska (the "panhandle," 2 known colonies, St. Lazaria and Forrester, G&L: 92) south off B. C., Washington (many sites), Oregon, and California to latitude of San Francisco (Farralones).

British Columbia sites

Apparently the Northwest coast is the stronghold of the Pacific population; here it far outnumbers the more northerly furcata (in Alaska see Murie 1959: 51, G&L 1959: 92; in Washington Dawson (1908) estimated 55-100,000 nesting birds in the Olympiades, contrasted to the single site recently discovered for furcata). In British Columbia known from open coast islets along the entire coastline.

COX ISLAND, QCI, Cloak Bay, SW shore Langara Island. 54°12' N, 133°01' W.

1920, July 22. The islet in Cloak Bay where Brooks reported nesting along with the fork-tailed on this date is undoubtedly Cox; details of what he found are lacking (Brooks & Swarth 1925).

1927, June 30. Darcus (1927) reported nesting here in 1927, and recorded taking the first egg in the area on this date (Darcus 1930); this record can now be referred to Cox as 1 egg taken by Darcus this date is in the WSM coll., labeled Cox, and 4 eggs, same data, in ROM.

1930, July 9. Cumming (1930) found this species nesting in company with the fork-tailed and collected adults with eggs, fresh eggs being taken this date.

1946, May 27. Adults paired in burrows, no eggs yet; with R. M. Stewart collected 8 (CJG MS).

1946, June 6. One pair adults collected from burrow; others excavated but no eggs found (CJG MS).

June 16-17. Guiguet observed the night flight (2300-0230) and examined about a dozen burrows on the 17th, finding paired birds in most, and in 4 one adult and one egg.

July 6. About 100 nests examined; 30 adults had 1 egg each; 3 pairs, without eggs; no downy young at all; remainder freshly prepared but empty. (CJG MS)

July 7. 20 more burrows excavated, in most fresh eggs; in 1 a pair without egg; and some freshly prepared but empty.

1947, May 28. The birds had arrived at the colony between May 13 and this date; Maguire reported 1 pair in a burrow, no egg yet (CJG MS).

May 31. Birds paired in burrows; no eggs. 5 adults collected (CJG MS).

July 4. 20 eggs collected, 1 adult brooding each (CJG MS). 10 of these now in WSM coll., 8 fresh, 2 well commenced

August 18. Approximately 30 burrows excavated: 1 held a pair (no egg); some empty; most with an egg brooded by 1 adult (ranging from fresh to well incubated); in 3, newly hatched downy young, the first seen in the 1946-47 study period.

1952, May 13. 6 burrows excavated, 4 with single and 2 with paired adults; no eggs yet. Colony here had more leucorhoa than furcata this season (CJG MS).

May 15. Paired and single adults in the burrows excavated; no eggs (CJG MS).

June 7. 20 burrows examined: 13 held paired adults, remainder singles; no eggs yet, and many freshly prepared sites (CJG MS).

TIAN ISLETS, QCI., E. Tian Head, forming W boundary Tian Bay, central W coast Graham Island. N islet: 53°46' N, 133°05' W; S islet: 53°45' N, 133°05' W.

1947, July 7. Paired adults in the few burrows excavated; no eggs were found (CJG MS).

OGILVIE ISLAND, QCI, W Louis Pt., E Port Louis, central W coast Graham Island. 53°41' N, 132°59' W.

1947, July 7. Almost every burrow here broken open by black bear, a set of primaries in each affording identification; the colony 90% destroyed (CJG MS).

QUEEN ISLAND, QCI, In Port Louis (of above). 53°42' N, 132°57' W.

1947, July 8. A large colony, likewise 90% destroyed by bears; identification by adult remains (CJG MS).

MACKENZIE ISLAND, QCI, across entrance to Kiokathli Inlet E Louis Pt., etc., 53°41' N, 133°00' W.

1947, July 7-8. Nesting in small numbers; black bear had just started their predations here. 1 burrow examined: empty; identification by adult caught in snap trap at burrow entrance on the 8th (CJG MS).

RANKINE ISLANDS, QCI, Carpenter Bay, SE end Moresby Island; W (larger) islet: 52°15' N, 131°04' W.

1960, August 17. Burrows plentiful here in mossy coast forest; 1 adult caught in snap trap (J. B. Foster, BCNRS).

STORM ISLANDS, Queen Charlotte Strait, 51°02' N, 127°43' W.

1929 Young (1930) reported a large colony here, but the date of his visit and details of what he found are lacking; he was in the area June 1-18, and apparently landed on Storm June 1.

TREE ISLETS, Queen Charlotte Strait, just NE Pine Island. 50°59' N, 127°43' W.

1929, June 13. Young (1930) found paired adults in their burrows here, but no eggs yet; a large colony.

PINE ISLAND, Queen Charlotte Strait, 50°59' N, 127°43' W.

1915-1933. P. C. Pike recalls many nesting on the island through the years he was lightkeeper there (Q).

1929, June 1-18. Young (1930) stayed with the Pikes over this period, and reported them nesting sparingly; up to the time of departure no eggs were found.

BUCKLE GROUP, outermost, probably Bright Island; Gordon Channel in Queen Charlotte Strait, centre of group (3 rock clusters) is 50°56' N, 127°39' W.

1934, August 10. Allan Lyon reported excavating a burrow with newly hatched young this date (McCabe MS Sept. 14, 1945). From the detailed information on all birds that Lyon was able to supply McCabe, it is clear that he was a capable observer who knew his area thoroughly; reliance can be placed on this record.

TRIANGLE ISLAND, outermost of the Scott Islands lying west of Cape Scott, N tip Vancouver Island, 50°52' N, 129°05' W.

1909, July 20. W. Burton collected an egg of this species here (PM).

1949, June 24-July 1. The same remarks apply as with the fork-tailed; the Museum party consider present nesting here probable (Carl et al. 1951).

SOLANDER ISLAND, off Cape Cook, Brooks Peninsula, NW coast Vancouver Island 50°07' N, 127°56' W.

1954, July 1. Guiguet (1955) reported nesting in large numbers. Burrows examined held adults on eggs, ranging from fresh to incubation just commenced (CJG MS).

CLELAND ISLAND (called Bare), W Vargas Island, S Brabant Channel, Clayoquot Sound, W central coast Vancouver I. 49°10' N, 126°05' W.

1925, June 19. A single egg collected by S. J. Darcus, adult in the burrow, in WSM coll.

1930, May 9. Burrows were noted all over the island; the petrels had not yet returned so species unsure (IMcTC MS); confirmation of present nesting required.

SEABIRD ROCKS, Pachena Bay, SE Cape Beale, NW Pachena Point, SW coast Vancouver Island. 48°15' N, 125°09' W.

1943, August 19. Pearse (1946b) found small young in the burrows (Pearse 1946a gives 1943 several times for date of visit; 1944 in 1946b is apparently a misprint).

1945, August 11. Pearse (1946b) excavated a burrow to find an adult incubating the single egg, which was sent to WSM coll., 1 dead adult and remains of others indicated some predator at work.

3. DOUBLE-CRESTED CORMORANT Phalacrocorax auritus

Nesting habits

G. F. van Tets (1959) has carried out detailed life history work on the cormorants of our Province, on which the following notes are based. The double-crest builds bulky nests (resembling those of a hawk) of sticks, roots, and branches, with usually a lining of grasses or seaweeds. These are placed in dense groups, either in trees or merely flat on the rock of the more gentle cliff shoulders or wide ledges of the bird island. When built on the ground the nests are begun as flimsy grass and seaweed accumulations, and the sticks, mostly gathered as driftwood on the tidelines, are worked in later. Nestbuilding (which is predominantly but not entirely a male activity) continues throughout the breeding season, especially at "changing of guard" during incubation, when the outgoing partner frequently makes a short flight to gather a stick on the sea, which it presents to its mate on the nest before going off to feed. Many nests survive the winter storms to be used anew the following year, so gradually substantial stacks develop (2'-4' high). These are jealously guarded, as nearby birds will pilfer unattended nests at once, adding the stolen material to their own drums; abandoned nests disappear rapidly in this way.

The male stands guard over his nest almost continuously and goes through a characteristic display from time to time; females are attracted by this behaviour, and eventually a pair is formed. Mating takes place on the nest, and usually 4 chalky-blue eggs are laid (maximum clutch 5). Incubation is shared by the parents and averages 28 days. The chicks, blind and naked when hatched, generally have one parent in attendance whilst the mate is off fishing, and are fed at the nest by regurgitation, the chick thrusting its bill and sometimes even the whole head into the gape of the parent. By the fifth and sixth week the chicks start to make short flights about the colony area, the parents following them about with food; eventually (sixth to seventh week) the young take trips to the water to fish on their own, and gradually become independent.

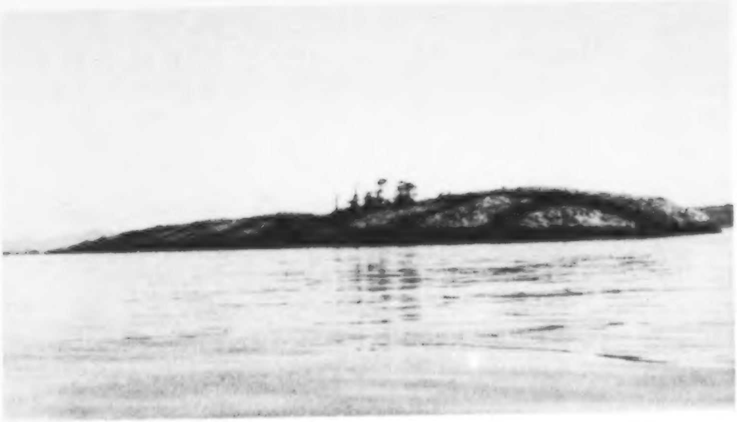


Fig. 6.

Mandarte Island, Haro Strait. August 8, 1960. R. Drent. Largest colonies of double-crested cormorant, pelagic cormorant, and glaucous-winged gull on the south coast. Pigeon guillemot and tufted puffin also nest. Low SE facing shore shown: open areas used by gulls, crannies and cavities throughout by guillemots.

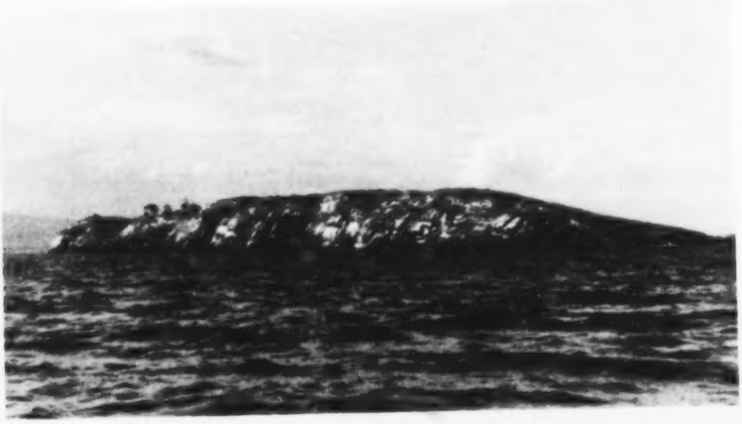


Fig. 7.

Mandarte Island, Haro Strait. August 22, 1960. R. Drent. Cliffy SW facing shore: the island is 1/2 mile long by 125 yards wide; highest point 95 feet. Pelagic cormorants nest throughout this face, double-crested cormorants in 3 subcolonies (central one in line with trees at this angle). Pigeon guillemots in crannies throughout; the 2 pair tufted puffin nests on this side.

Season in British Columbia

Most eggs are laid from mid-April to late May when the birds are undisturbed; in favourable years (e.g. 1959 on Mandarte I.) two broods may be raised by some birds, a second wave of egg-laying occurring in early August. Normally the young will be gone by the end of September.

Species breeding range (A.O.U. 1957: 35-36)

SW Alaska (Lake Iliamna, Kodiak), Aleutians (west to Islands of the Four Mountains Murie 1959: 54), B. C.'s south coast, central Alberta, central Manitoba, James Bay, Gulf of St. Lawrence and Newfoundland south to Baja California, Guerrero in Mexico, Cuba, Florida, and the Bahamas.

Subspecies breeding range: (P. a. albociliatus)

From southern B. C. south along coastal Washington, Oregon, and California to Baja California and islands in the Gulf of California, and in the interior of S Oregon, W Nevada, California, and Arizona.

British Columbia: Discussion of Colonization

The four colonies in our Gulf Islands represent the northern outpost of the subspecies, and there is a huge hiatus before cincinatus starts in Alaska (Kodiak, and probably Kenai Peninsula, westwards, see Murie 1959: 52-55, G&L: 94-95). This situation is of particular interest since the recent establishment of the British Columbia colonies has been documented (Munro 1928, Sprot 1936); nesting started in the late 20's, early 30's. Munro (1937) provided a valuable review; history of the individual colonies will be detailed below.

Whence came the colonizers? There are no known colonies on British Columbia's open coast, (however, it should be pointed out that Barkley Sound is unexplored) but Dawson (1908) in his concise census of the Olympiades, islets off Washington's NW coast, records a total breeding population for the double-crest of about 400 pair (counts carried out 1905 and 1907). Dawson and Edson travelled through the San Juans June 13-28, 1905, visiting the principal sea-bird colonies, but did not even sight any double-crests (Edson 1929). Yet today double-crests nest at two of the colonies they visited, and at least 2 others exist on the inner

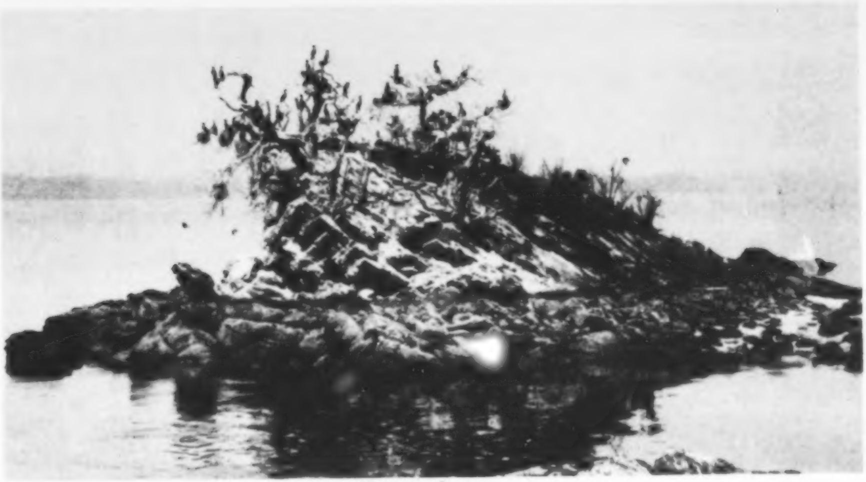


Fig. 8.

Ballingall Islets. April 24, 1941. Photo Branch, B. C. Gov't. Double-crested cormorant: about 3 dozen nesting pair at the oldest known B. C. colony (established c. 1920). Nesting has continued in these junipers from first report (1933) to the present (28 in 1959). Pelagic cormorants nest on cliff at left, gulls on slope to rear. Viewed from south islet, where recently double-crests have commenced nesting flat on the rock.

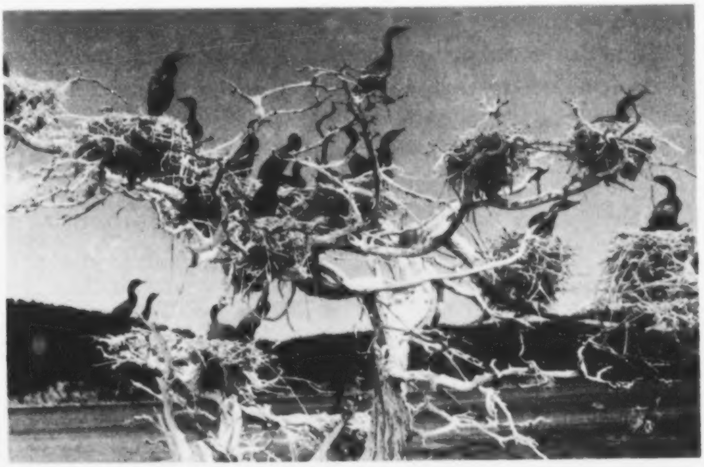


Fig. 9.

Ballingall Islets. July 22, 1941. Photo Branch, B. C. Gov't. Double-crested cormorants: part of the Rocky Mountain Juniper group of Fig. 8. Adults and well-grown young as is normal for this date (bird 2nd from left at top is a young of the year, about ready to leave nest). Today the colony is so much disturbed by man that practically no young are raised. Cormorants should be observed from the distance, and on no account put off the nest.

Washington coast, also of recent origin. It seems reasonable to suggest that extension into British Columbia has been a part of a general expansion into inner waters, the birds most likely stemming from Washington's west-coast colonies.

Although technically beyond the scope of this catalogue, it may be of value to summarize evidence for the recent establishment of the double-crest as a nesting bird on Washington's inner coast. Published accounts offer the following sketch:

1905. In June Dawson & Edson find no evidence for nesting in the San Juans (Edson 1929).

1909. Based largely on this material, Dawson & Bowles (1909) list no inner coast breeding sites.

1933-34. Lumley (1934) visits one of the sea-bird colonies which now has nesting double-crests, but notes none.

1935. Miller et al. (1935) in their "Birds of the San Juans" give the status of the double-crest as follows: Resident on ocean coast, but an occasional summer visitor to Strait of Juan de Fuca.

1939-53. Wick (1958) summarizing work on Protection (1939-42) and Eliza (1947-53) Islands, gives "permanent resident," symbolizing the changed status.

1953. Jewett et al. (1953) still list no inner coast sites, the only interior records being 2 sites on the Columbia. This indicates that at best the San Juan colonies were poorly known.

Mr. Garrett Eddy (Seattle), Dr. Frank Richardson (University of Washington, Seattle), and Mrs. McN. Schultz (Mountlake Terrace), who have been actively studying Washington sea-birds over the years, have kindly supplied me with their notes on double-crest nesting sites; when combined with the published accounts above, the pattern of recent establishment is borne out:

PT. DISNEY, S tip Waldron Island, San Juan Islands, 48°41' N, 123°01' W.

1905, June 20. Dawson and Edson camped in Cowlitz Bay overnight, and noted the gull colony on Pt. Disney.

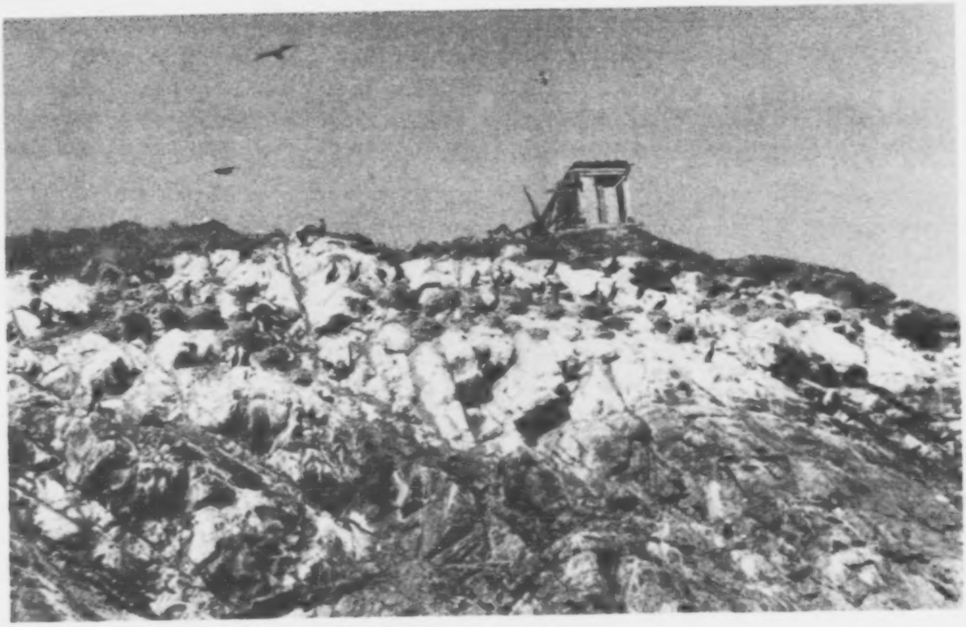


Fig. 10.

Mandarte Island. August 22, 1960. R. Drent. Double-crested cormorant: central (main) subcolony of c. 77 nests; observation blind on skyline. Most nests have well-grown young; group of older young at far upper left have wandered from the nest. The stacks at left have accumulated through many years' use. Note site: rounded cliff-shoulder; area whitened by droppings (termed guano). Mandarte was B. C.'s second colony (1st report 1927, cf. Fig. 18).

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1905, June 23. Dawson & Edson investigated the Pt. Disney colony this date, estimating 100 pair gulls nesting; there were signs of pelagic cormorant nesting formerly (Edson 1929). It is inconceivable that these two observers could fail to note double-crests had they nested then.

1934, July 4. Lumley (1934), who had also visited the colony in 1933, found 19 cormorant nests on a single ledge, holding eggs; it is not clear if he referred to Brandt's or pelagic, probably the latter; in any case no mention of double-crests was made. He was one of the authors of the "Birds of the San Juan Islands" cited above, and surely would have included nesting notes there had he secured any.

1947-48-49. Double-crest nests seen from boat; approximately 6-8 pair nesting. Information Mrs. Z. M. Schultz.

1957, May 31. 16 plus nests occupied by adult pairs; had been in use for several years. Information G. Eddy and Dr. F. Richardson.

COLVILLE ISLAND, off SE end Lopez Island, SJI 48°25' N, 122°49' W.

1905, June 17. Dawson & Edson explored the island and found no sea-birds at all; Edson shot a mink there, explaining this absence; but if double-crests had nested in those times at least remnants of nests would be visible, supposing that mink had wiped out a former colony.

1948-1958. Mrs. Schultz found double-crest nests in 1948, when she first visited the island; there were no breeding birds then, but a photograph taken at that time shows a dense accumulation of about 35 nests crowded together on the rock; this was about 1/2- 2/3 of the total. The nests were obviously of some age, some stacks being about 3' high; this is undoubtedly the oldest recorded colony. The birds are severely persecuted here, and only manage to nest successfully in some years. 1957 was one of these, when Mrs. Schultz noted about 8 nests with eggs or young; about 25-50 nests were occupied that season.

1957, August 4. 26 plus nests with about 3/4 grown young, information G. Eddy and Dr. F. Richardson.

POINT NO POINT, Admiralty Inlet, across from S end Whidbey Is.

1958. Mrs. Schultz noted about 12-20 nests on framework of old naval target here; no other information available.

PROTECTION ISLAND, at entrance of Port Discovery, NE tip Olympic Peninsula

Dr. F. Richardson and G. Eddy have been visiting this island for some years now, and have followed establishment of the double-crest on a ledge on the northeast side of the island, on a high sand cliff.

1956-1958. Definitely not nesting.

1959. 3-4 pair nested; this was the first record.

1960. Some 12 pair nested; possibly more.

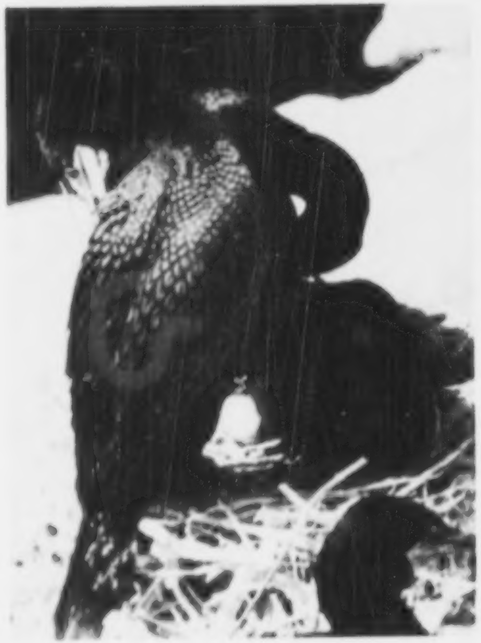

Fig. 11.

June 28, 1960. R. Drent. Mandarte Island. Double-crested cormorant: pair on the nest with 16-day-old chick (resting); note infertile egg. Adult: large size, large orange throat pouch, heavy bill. Note bulky stick nest.

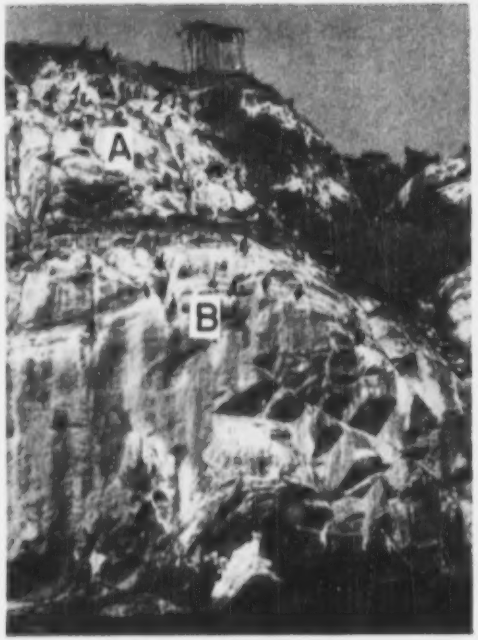

Fig. 12.

August 22, 1960. R. Drent. Mandarte. A contrast in cormorant nesting habitat. Double-crests at A, rounded cliff-shoulder where broad ledges are used; pelagics at B, nesting in niches on sheer cliff face.

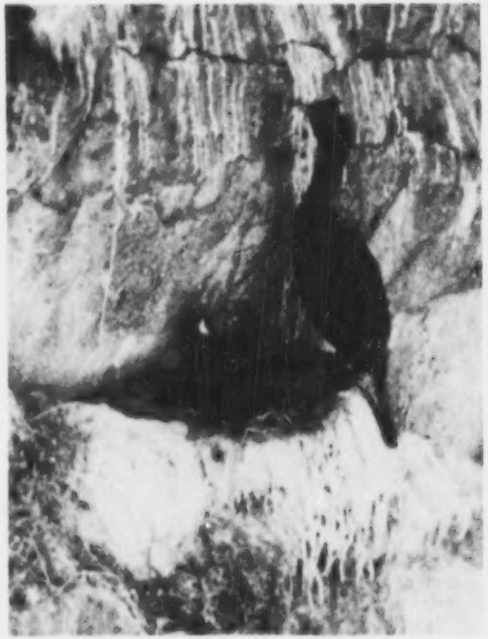

Fig. 13.

August 5, 1960. R. Drent. Pelagic cormorant: parent with 2 weeks' old chick. Adult: smaller size, scant dull red throat patch, thin bill, fore & aft crests on head; generally more snaky. Note grass nest, cemented to niche by guano.

In summary, the double-crest has not "always" nested on Washington's inner coast; the known colonies probably were established as follows:

Colville Island	after 1905, definitely the oldest; suggest 1920's
Pt. Disney	after 1934, before 1947; probably early 1940's
Protection Island	1959
Point No Point	unknown; small colony 1958

The British Columbia Colonies (numbered in order of establishment)

1. BALLINGALL ISLETS, Trincomali Channel, NW Montague Harbour, Galiano Island, just N Wise Island, 48°54'N, 123°37' W. 2 islets, here called N & S.

Although the Mandarte colony has been known since 1927, the condition of the colony here when first described to Munro (1933) led him to believe that it was older; it was therefore the first for the province.

1933. Reported to nest by P. Thornton. (Munro 1937)

1934, May 8. C. F. Barrow and W. A. Newcombe visited the colony (Sprot 1936).

1936, June 14. Sprot (1936) Barrow & Newcombe found 23 nests on the N islet, the total for the colony; 10 nests were examined: 4 empty, 3 with 4 eggs, and 3 with 2-3 eggs.

July 7 (not June 7 as given in M-C: 51). Munro (1937) paid his first visit to Ballingall this date, and found 23 nests, all placed in the clump of gnarled Rocky Mountain juniper on the N islet; the S islet had no double-crests. The nests examined held eggs or eggs with newly hatched young.

1939, August 17. Young found (M-C: 51) 33 nests, all in juniper clump, 5 empty; remaining 28 with 68 young, ranging from 1 week to full fledged (IMcTC MS).

1957, August 8. Cowan (MS) found 74 nests: 26 in juniper clump, 48 built on the rock, with a total of 8 eggs and no young, the result of heavy disturbance; both islets in use.

1959, June 28. N islet: 28 nests, all in the same juniper clump: contents not examined for fear of excessive disturbance;

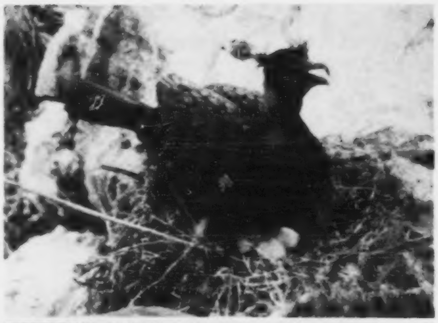

Fig. 14.
Mandarte Island. June 3, 1960.
R. Drent. Double-crested cormorant: adult rises to shift eggs, held on webs of feet. Feather tufts at sides of head show reason for name. Note large orange throat patch; mouth lining is blue, eyes turquoise--a striking colour combination. The bird pants from the heat. Nest new this season; first egg laid c. May 28, grass & seaweeds only; by now a few sticks have been added.

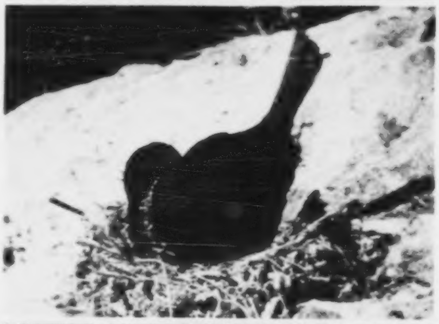

Fig. 15.
Mandarte Island. June 28, 1960.
R. Drent. Double-crested cormorant: adult nestbuilding (an activity going on through the season). Another new nest as above: first egg c. May 28 (grass & seaweeds); here the bird is brooding 4-5 day old young; note substantial accumulation of sticks in interval. Compare with above.

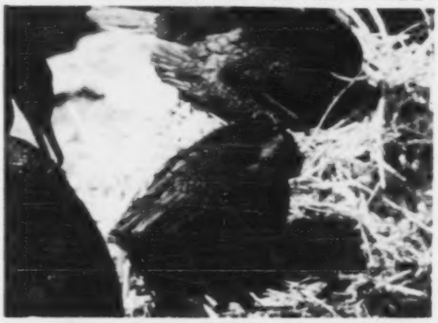

Fig. 16.
Mandarte Island. June 28, 1960.
R. Drent. Double-crested cormorant: feeding. The chick (1 of 2 in nest: 7 or 9 days old) has depressed the hyoid, spreading the throat pouch, and with quivering head begs; the parent prepares to regurgitate.

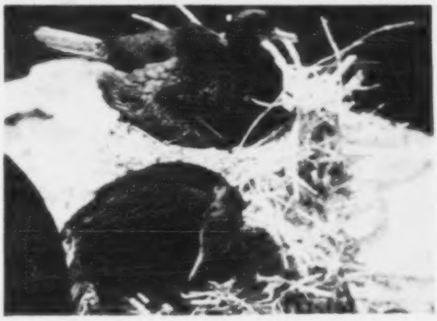

Fig. 17.
Mandarte Island. June 28, 1960.
R. Drent. Double-crested cormorant: feeding (cont'd). The head of the chick disappears entirely into the gape of the parent, where it hungrily swallows the fish regurgitated by the adult. Note posture of adult in background, typical for birds brooding small young.

adults on the nest but no young. S islet: 31 nests, built flat on the rock: 10 empty but occupied, 21 with eggs (1-6, 2-4, 3-6, 4-5). R. & J. Drent, BCNRS. Thus the juniper clump contains almost exactly the same number of nests as in 1936; expansion of the colony was the result of a new nest group on S islet, now decreasing.

2. MANDARTE ISLAND (also called Bare or Ridge), Haro Strait, E Miner's Bay, Sidney Island, 48°38' 123°17'.

1927, July 19. W. Burton had detected at least 1 double-crest pair nesting here amongst the pelagic cormorants earlier in the season, and on this date Munro accompanied him to verify the discovery (Munro 1928). They found 3 nests: 1 with 2 eggs, 2 empty. All were built flat on the rock on a ledge of the northwestern cliffs, highest portion of the island.

1932, June 25. Set of 4 eggs (hard set), collected from sizeable stack of small sticks and seaweed, placed on rock shoulder 50' above sea (WSM coll.)

1935, August 22. Munro (1937) again visited the island this date, and found 5 nests, all with eggs.

1936, July 18. Munro (1937), on his next visit, found the colony further expanded: 9 occupied nests were noted, all with eggs; they were placed in 3 groups of 3 in situations similar to the 1935 nests. In addition the original nest discovered by Burton was still in good repair, although not then in use; 3 nests from 1935 were apparently abandoned (it is unclear if any of the 1935 nests were again used in '36). Some of these might later have been occupied, however, as the total group was estimated at 11 pair.

1942, A. L. Meugens (pers. comm.) paid his first visit to Mandarte this year and noted c. 15-20 pair nesting in the original ledge area photographed by Munro in 1936. Meugens has a photograph showing that the present north colony could not have been in existence then; other groups are exceedingly unlikely.

1945, May 27. The Victoria Natural History Society field group noted 23 nests (A. R. Davidson); these were still all in the north end ledge area (A. L. Meugens, pers. comm., took part in trip). Whether other groups had become established by then is unclear.

1953, June 27. VNHS reported 3 subcolonies: 55, 25, and 65 nests (total 145), not all occupied (A. R. Davidson). A. L. Meugens (*pers. comm.*) collected 3 eggs this date from the north subcolony (25 nests).

1957-59. G. F. van Tets, who lived on the island each summer in these 3 years, reports about 150 pair nesting each season, distributed in three subcolonies.

1960, August 31. Drent took a count of nests that had been occupied during this summer, and found the 3 subcolonies, from N to S, to contain: (a) at least 14, possibly 18 (count from photos August 22, verified by F. Tompa November 6), (b) 77, single dense group, (c) 44, somewhat dispersed. Thus at least 135, and possibly as many as 150 pair, nested this past season, 33 years after Burton found the first nest. The colony seems to have remained stable for at least the past 7 years.

3. CHRISTIE ISLET (other names Centre & Cynthia; cf. account under glaucous-winged gull), Howe Sound, S Irby Pt., S tip Anvil Island, 49°30' N, 123°18' W.

1941, May 31. W. S. Maguire collected a set of 5 eggs here this date (WSM coll.), describing the nest as a small stack of sticks with a saucer-like depression lined with a scanty amount of seaweed. He was familiar with double-crest nests and eggs from the Mandarte Colony, and his description rules out pelagic. Numbers found not noted (?single pair). Colonization here has not been successful; Wm. Hughes remembers a single pair nesting here one season (?1948-54) but certainly none have nested since '55.

4. CHANNEL ISLETS, Swainson Channel, off Yeo Pt., Saltspring Island, W (wooded) islet. 48°48' N, 123°23' W.

1930. R. Mathews of Randle's Landing, V.I., has seen birds roosting here since about this time; he is not certain when nesting began.

1951-52. A. Best, who spends his summers at Ganges, Saltspring, likewise has noted roosting for many years, but saw the first nests in this period; they certainly did not nest in the twenty years preceding.

1959, June 28. 16 nests were found, grouped together about 50' up in several dead Douglas firs, roughly halfway along the E side, close to the beach; adults were on the nest, but no chicks could be seen; 3 crow-punctured eggs were picked up. (R., J., & J. J. Drent, BCNRS).

5. ADMIRAL or Light Island (also called Second Sister), outermost of islets in Ganges Harbour, Saltspring Island, 48°50' 123°27'.

1956. As with the previous colony, A. Best has seen roosting double-crests here since about 1920, but noted the first nests in 1956, when about 8-9 were built. K. Wade (Q), also reports nests in this year.

1957, July & August. Reported to nest by K. Wade (Q).

1959, June 28. 9 nests, 50' up in Douglas fir snags, on the E side of this densely wooded islet. Adults were on the nest, but no chicks could be seen (R., J., & J. J. Drent, BCNRS).

1960. At least 4 pair reported to nest (Mrs. Slater, PM records).

6. RED ISLETS (largest in cluster), W Diver Bay, E Ellen Bay, SE shore Prevost Island. 48°49' N, 123°21' W. SUSPECT ONLY.

1960. R. Mathews has noted roosting birds here for years; A. Best noted roosting and possible nesting in July (seen from distance). Checking by binoculars from a ferry passing close by, I could detect no nests, but adults were roosting in snags ideal to the purpose (October 28 & December 9). This islet should be kept under close observation, for here the next colony will likely be established.

4. PELAGIC CORMORANT Phalacrocorax pelagicus

Nesting habits

Again the work of G. F. van Tets (1959) has been relied on for detail. We have seen that the double-crest, besides nesting in trees, commonly utilizes broad cliff-ledges, and especially the gentle, rounded areas close to or at the cliff crest. The pelagic, on the contrary, never nests in trees (it never even perches in them), and prefers narrow ledges, cracks, and mere niches on precipitous cliff-faces; thus well below the crest. The nest is therefore usually backed by a rock-face. Small groups may nest in outlandish situations however (buoys, low skerries) where such is not the case. The distinction in nesting habitat between the two cormorants is shown nicely where they nest on the same island (e.g. Mandarte, Ballingall).

The male chooses the nest site and takes the major share in nest-building. The chief building material is dry grass, plucked near the colony, wherever the cormorants can land without disturbance from gulls etc.; some favoured gullies can be completely denuded by this grass collection. The grasses, and sometimes a few algae, are moulded into a shallow saucer, and as the season progresses this saucer is firmly cemented to the rock by guano. Where the nest is firmly seated in the rock-face it may survive the winter to be used as a foundation the following season; in more exposed situations it is washed away by rain and surf over the winter (this is generally the case in British Columbia).

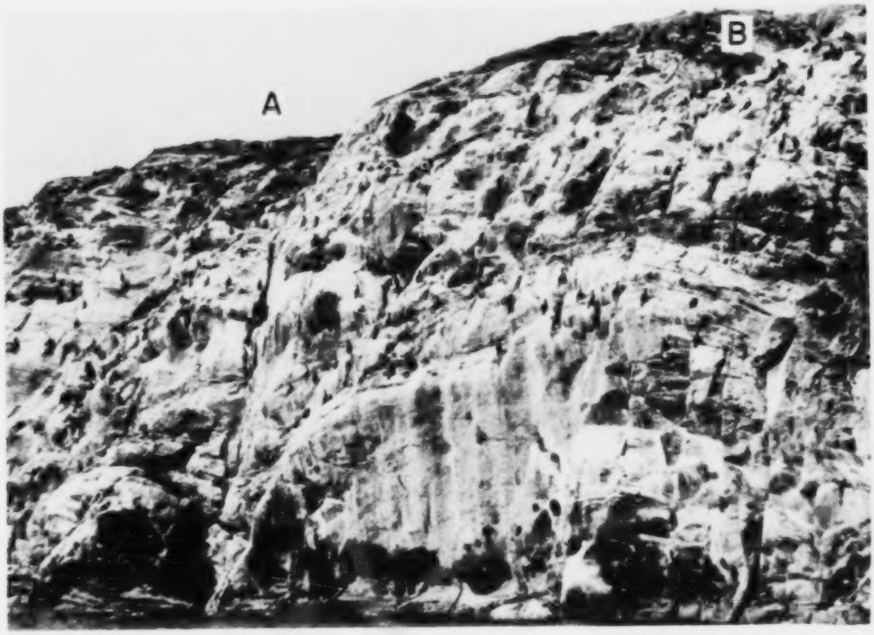

Fig. 18.

Mandarte Island. August 22, 1960. R. Drent. Pelagic & double-crested cormorants. The sheer walls are occupied by pelagics facing inwards perched on the nest-rim; the shoulder at B holds the greater part of the northern double-crest subcolony. The cliffs here rise to 95 feet. In the gap at A the double-crest first nested on the island; none are there now.

The male displays at the empty nest until he attracts a female; this display is of the same type used by the double-crest, but shows certain differences that make it specific to the pelagic. Mating occurs on the nest and (usually) 4 eggs, blue overlain by a chalky deposit, are laid. Both parents incubate, holding the eggs on the webs of their feet, and facing inwards to the cliff, their long tails protruding over the nest-rim. Bits of material are often added to the nest at relief, the outgoing bird returning with a beakful of grass before going off to feed. Incubation period averages 31 days, and the chicks, naked at hatching, are closely brooded at first. Both parents feed the chicks at the nest with regurgitated fish (process similar to double-crest), until the young wander from the nest and gradually attain independence, about the 6th or 7th week.

Season

The first eggs are laid at the close of May (26th Mandarte, 26th Race Rocks), but the heaviest egg-laying occurs in the second week in June (49/76 clutches started, Mandarte 1958); the birds are capable of replacing lost eggs over long periods, and fresh eggs have been noted as late as August 4. The colony is usually deserted by the close of September, the young having left by then.

Species breeding range (A.O.U. 1957: 37-38)

From west of East Cape, Siberia, south through Kamchatka, Kuriles, to Japan and S China; and from Alaska south to central Baja California. Throughout its range it is a strictly coastal bird, never nesting inland.

Subspecies breeding range: P. p. pelagicus

Portion of the Arctic coast of Siberia and East Cape south to Kuriles and Honshu, Japan; and from Bering Strait (and occasionally Kotzebue Sound G&L: 97), Norton Sound, the islands St. Lawrence, St. Mathew, and Nunivak, and throughout the Aleutians (Murie 1959: 55-56) east (Cook Inlet) to Alexander Archipelago (including Forrester Island, G&L: 98), and Langara Island in the Queen Charlottes.

Subspecies breeding range: P. p. resplendens

From Mandarte Island, B. C., south to Los Coronados Islands, Baja California.

British Columbia Sites

This cormorant nests throughout our coastline, but the zone where the subspecies meet is still undetermined.

LANGARA ISLAND, QCI (Old name North Island) off NW tip Graham Island. exact locality uncertain:

1920, July. Nesting according to Brooks (Brooks & Swarth 1925).

1927, April 10-July 13. Darcus (1930), working the area in this period, reported two large colonies on the island, the larger on the western side, not occupied in 1926, but with at least 500 nests this year; the other colony is obscure.

1930, July 17. Cumming (1930) reported two colonies for the island, used in alternate years; eggs were collected this date.

1. Langara Island Light, Langara Point (Cape Santa Marguerita), NW tip of island, 54°15' N, 133°04' W.

1946, July 2. 200 plus pair were found nesting in a gorge ca. 1/2 mile east of lightstation; most nests held young, but all stages from eggs to large young were represented (CJG MS).

July 3. 2 sets of eggs collected: 1-4, 1-3 (CJG MS).

1947, May 22. The colony had shifted to just below the lightstation; 200-300 pair were present. Courtship and nestbuilding were observed; no eggs yet (CJG MS).

July 2. Eggs were received from the lightkeeper (WSM coll. July 1, 1-3, 1-4, fresh) who reported that the cormorants had been so badly disturbed by marauding crows that they had shifted back to the 1946 gorge, and were then laying there (CJG MS).

1952, May 17. Occupying the easternmost rookery at the lighthouse--birds observed flying in and out (CJG MS).

1957. About 100 pair nesting in the 1946 gorge (second ravine on shoreline 1/4 mile E of light) and about 150 pair below the lightstation, as reported by the lightkeeper, E. A. Hartt (Q).

1958. About 150 pair nesting below the lightstation; none in gorge. EAH.

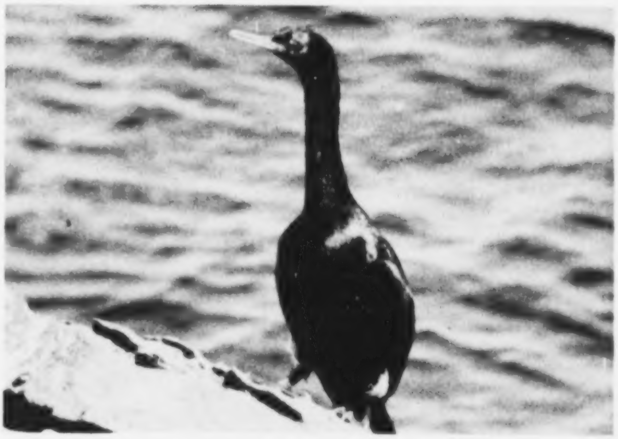

Fig. 19.
June 3, 1960. R. Drent. Mandarte. Pelagic cormorant: adult lands on NE side to gather grass. Note thin bill, scant bare patches on face (red), sleek plumage, white thigh patches (worn only in breeding season).

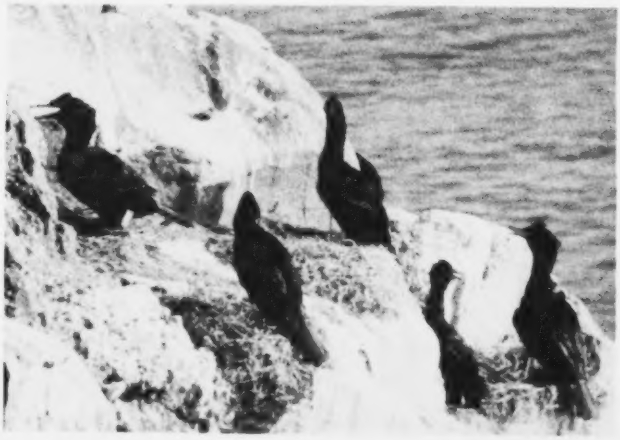

Fig. 20.
June 1, 1960. R. Drent. Mandarte. Pelagic cormorant: group of nests, adults on guard but no eggs yet. Birds are panting from the heat. White thigh patches & fore & aft crests on head shown.

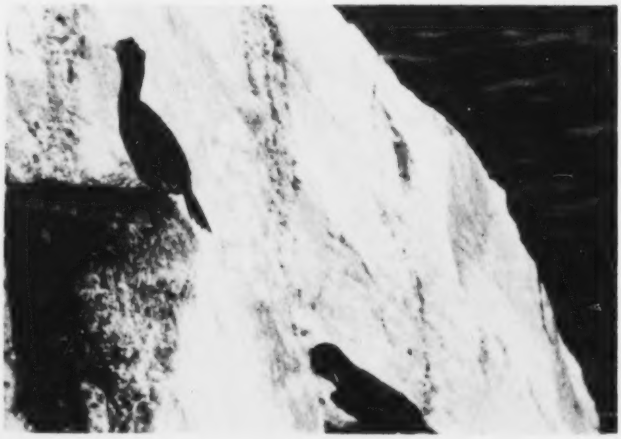

Fig. 21.
June 1, 1960. R. Drent. Mandarte. Pelagic cormorant: adult on guard on empty nest, at this stage a loose and flimsy saucer of grass; later cemented to rock (cf. Fig. 13). This site has been in use several seasons.

1959. About 75 pair nesting below the lightstation; again none at gorge. EAH.

2. Cliffs west of Iphigenia Point, W Henslung Cove, on Cloak Bay, 54°12' N, 133°01' W.

1946, May 27. About 50 birds noted on cliffside, some at nests (CJG MS).

June 6, 8, 9, 10. Same number seen at nests again (CJG MS).

1947, May 13. The colony had not yet formed this date. Observations throughout the season showed that the birds did not nest here; perhaps the 1946 group had joined the Cox Island colony.

1960. Not nesting (J. B. Foster, BCNRS).

COX ISLAND, QCI, Cloak Bay, SW shore Langara Island. 54°12' N, 133°01' W.

1952. Nesting in chimney-like clefts here, so far as CJG can remember also in 1946/47; this year a good-sized colony N side (CJG).

SKEDANS ISLANDS, QCI, S Cumshewa Inlet, E Louise Island. 52°57' N, 131°34' W.

1900, June 26-July 2. Osgood (1901) stated "a few breed on the Skedans Islands"; he made a trip to this area sometime in this period. Confirmation of present nesting required.

SKEDANS POINT AREA, NE shore Louise Island, QCI. Exact colony site undetermined: point is 52°58' N, 131°36' W.

1946, August 19. About 100 pair nesting on the cliffs, feeding young (IMcTC MS). Photograph taken then shows the colony to occupy a stack at the entrance to Skedans Bay; probably the designation here is correct.

Islets west of KUNGHIT ISLAND, S end QCI.

1900, July 3-c. July 8. Osgood (1901) reported: "a few breed... on some of the islets off the west coast of Prevost Island (an old name for Kunghit)." He investigated the area in this period. Present-day exploration required.

Unwooded and unnamed islet 1 mile S TRIPLE ISLANDS, NW Tree Nob group, Brown Passage, NW Stephens I., c. 20 miles W Prince Rupert, 54°17' N, 130°53' W.

1950, July 1. G. C. Odlum (Q) lightkeeper at Triple Island at the time, visited this islet and noted a colony of at least 12 pair; nests were found.

Reefs off BLENHEIM ISLAND (also called White Cliff Island), Queen's Sound, S Breadner Group, 51°47' N, 128°16' W.

1948, July 28. Small colony of 35 pair found here; the birds were courting and carrying nest material, and apparently some had eggs (Guiguet 1953).

Vicinity of DEEP SEA BLUFF, southern shore Simoon Sound, near entrance, (S Kingcome Inlet, E Broughton Island).

1792, July 31. Menzies, physician and naturalist on Vancouver's famous expedition, reported a "shag" colony here; Menzies wrote in his journal: (Newcombe 1923: 92) "...in the afternoon I accompanied a shooting party who went in a small boat under a high perpendicular Cliff about two miles off...our Game was a particular kind of shag...that were breeding in the Horizontal Crevices of the Rocks & at this time were very numerous as the young ones were beginning to fly, to them our chief aim was directed with some success & we found them next day very palatable." Unfortunately I have been unable to find if this, the oldest recorded colony in the Province, is still in existence.

TRIANGLE ISLAND, outermost of the Scott Islands, lying W Cape Scott, N tip Vancouver Island. 50°52' N, 129°05' W.

1949, June 24-July 1. Two colonies were located by the Museum party; one on the east side, the other on the west, estimated to total 1200 pair; other parts of the island were also utilized. Birds were seen courting and carrying nest material; also fresh eggs were found (Carl et al. 1951).

SARTINE ISLAND, next in line of Scott Islands to E, 50°49' N, 128°54' W.

1950, June 21-22. The Museum party found no nesting cormorants here on their brief visits, but judging from the numbers of birds present, colonies are located somewhere on the island (Carl et al. 1951).

BERESFORD ISLAND, still further E in Scott Islands, lying to W of Lanz, 50°27' N, 128°46' W.

1950, June 20-22. Nesting; eggs noted (Carl et al. 1951).

SOLANDER ISLAND, off Cape Cook, Brooks Peninsula, NW coast Vancouver Island, 50°07' N, 127°56' W.

1954, July 1. Guiguet (1955) reported nesting here in numbers.

Reefs SE AMOS ISLAND, E end Mission Group, S McKay Cove, W Union Island, outside Crowther Channel, Kyuquot Sound. 50°01' N, 127°21' W.

1957, July 20. Approximately 50 pair; nests seen (CJG MS).

HOHOAE ISLAND, Kyuquot Sound, E side, Bordering Pinnace Channel, 50°03' N, 127°12' W.

1958, July 1. c. 12 pair nesting (reported to CJG).

CLARK ISLAND, W Grassy Island in Barrier Group, outside Kyuquot Channel, Kyuquot Sound 49°55' N, 127°15' W.

1958, June 28. Nests observed (CJG MS).

BAERIA ROCKS, Imperial Eagle Channel, near head, Barkley Sound, NW Tzartus Island, 48°57' N, 125°09' W.

1960, July 18. 6-8 pair apparently nesting on this bird islet; passed by in Uchuk and took slide; too far to see nests (A. R. Wootton, *pers. comm.*). Confirmation required.

CAPE BEALE LIGHTSTATION, SW entrance Barkley Sound, 48°47' N, 125°13' W.

1947, July. In a cave 100 yds. south from the lighthouse J. A. Brooks, Fisheries Guardian (Q) reported approximately 20 nests with well-grown young; access was by two entrances, one at water level, one farther up the cliffside.

1959, July 6. 14 nests tallied by T. Widdowson (BCNRS) at lighthouse itself; only 3 held eggs (1,4,4), eggshells lying about above indicating recent disturbance.

SHERINGHAM POINT, SW coast Vancouver Island on Strait of Juan de Fuca, 48°23' N, 123°35' W.

1958. Reported to G. F. van Tets (MS) by Bamfield residents. Confirmation required.

RACE ROCKS, Strait of Juan de Fuca, S Metchosin, SE Bentinck Island, 48°18' N, 123°32' W.

1937, October 14. Remains of nests seen; rock concerned not clear (McCabe MS).

1953-55. G. C. Odlum (Q) reports that cormorants have nested every year on Great Race since he was stationed lightkeeper there in '53; in the 1956-58 seasons nest record cards were kept covering all nests.

1956, July 8. More than 23 nests, with eggs and some young. GCO, (BCNRS).

1957, May 31 and June 22. 21 nests with eggs tallied. GCO, (BCNRS).

1958, May 16 to July 1. Egg-laying was followed in 27 nests. GCO, (BCNRS).

1959. Approximately 45 pair nesting, with colony area increasing and a new subcolony established on the other side of the island, 100 yds. away. Mr. Odlum writes that the increase since he became lightkeeper here may reflect his policy of non-interference as contrasted to that of his predecessor, who disliked the strong odour of the sea birds and destroyed eggs in an attempt to break up the colony.

Islets in the vicinity of Great Race Rocks.

1924, July 23. Munro (1925) landed on North Race for gull banding, and noted no nesting pelagics.

1958, July. G. C. Odlum (Q) visited several rocky islets within 1/2 mile of Great Race, towards the Vancouver Island shoreline, and estimated 75 pair nesting altogether.

QUADRA ISLAND, bluffs NW Quathiaski Cove, SW shore (near Campbell River, Vancouver Island). 50°03' N, 125°14' W.

1959. Colony viewed from water, apparently nesting in large numbers (O.S. Dean, lightkeeper at Quathiaski Cove, Q). Confirmation desirable.

MITLENATCH ISLAND, Strait of Georgia, SW Hernando Island, NE Oyster River, Vancouver Island. 49°57' N, 125°00' W.

1949, August 18. Theed Pearse has been banding glaucous-winged gulls on this island off and on since 1921, and recently summarized changes he noted through the years (Pearse 1956). First evidence of cormorants nesting on Mitlenatch was when R. Fryer saw 2 groups of 8 and 10 nests, with eggs and young, on the west side on this date. Possibly there were more nesting on other portions of the cliff-face. Pearse feels that nesting here began after 1946 (none noted), and definitely after 1943, when the island was thoroughly worked over by his party of banders.

1955. Laing reported dozens nesting (Pearse 1956).

1959, July 20 and August 10. D. Stirling counted a total of 143 nests, with eggs and young (Q).

1960, July 6-7. 11 nests were inspected (7 held eggs, 4 empty) and the colony estimated at 150 pair. D. Stirling (BCNRS).

July 28. A total count was made, and 155 nests tallied (empty and with eggs). Wm. Merilees (BCNRS).

ST. JOHN POINT, Hornby Island, Tribune Bay side, 49°31' N, 124°36' W.

1955, June 7. Pearse (1956) reported a colony of some 50 pair on this date, and states that none were nesting in 1938 when the same cliffs were inspected.

1957, August 23. Rev. John Stainer (Q) reports that he approached the colony by clifftop, noting more than 30 pair nesting on the ledges; the adults were feeding young at the time. This was only a part of the colony.

1960, July 10. G. E. Seon (BCNRS) made a special circuit of the area by boat with two friends, and the three observers reached an estimate of 400-500 birds roosting on the cliffside; the number actually nesting could not be ascertained.

July 21. G. E. Seon reports that on this date a Mr. Allen was able to examine 3 nests from above, all with eggs (1, 2, 3); crows were noted in the area, and many eggshells in the field above.

BALLENAS ISLANDS, north cliffs of N islet, Strait of Georgia, N Nanoose Harbour, Vancouver Island. 49°21' N, 124°09' W.

1952-56. Mrs. A. G. Waldon, lightkeeper's wife, reports (Q) nesting in each of these seasons, young being noted in the nests. No count.

CHRISTIE ISLET (other names Centre and Cynthia; cf. account under glaucous-winged gull), Howe Sound, S Irby Pt., S tip Anvil Island, 49°30' N, 123°18' W, and PAM ROCK (other name White Rock), S Christie, 49°29' N, 123°18' W.

1946, June 8. 3 sets of eggs (4, 4, 4) in WSM coll., from fresh to cartilaginous embryos; all on Christie.

1948 onwards. In this year Wm. Hughes made his first trip to the islet; every season since 1949 he has banded glaucous-winged gulls there with the aid of other members of the Western Bird Banders' Association. Cormorants have nested every season, but the colony is rapidly dwindling, undoubtedly the outcome of ever-increasing disturbance. Pam Rock was used every year at least until 1956, but there have definitely been no nests there since 1958. Counts are presented below.

1950, June 11. WSM took 5 sets of eggs, and estimated the total number of nests at 25-30 (? including Pam).

1955, June 26. 7 nests, all with eggs, tallied on Christie by Wm. Hughes & R. E. Boston (BCNRS).

1956, June 10. A. L. Meugens and J. K. Cooper estimated 20-25 pair total for both islets (Q); 8 nests with 1-4 eggs were found on Christie, 6 with eggs on Pam; no young had hatched yet.

June 26. Wm. Hughes (BCNRS) tallied 15 nests on Christie, both eggs and small young were found.

1958, June 22. Wm. Merilees and G. M. McKay tallied 24 nests on Christie, the total; both eggs and young were found (BCNRS); none were found on Pam.

1959, June 21. The same two observers were able to find only 8 nests on Christie, with eggs only (BCNRS); again none on Pam.

1960, July 15. Colony disappearing: accessible shelf which held nests in 1958 empty; a few occupied nests on cliffs, checked and all found to be empty; production for season nil (Wm. Hughes, pers. comm.).

HUDSON ROCKS, Horswell Channel, N Newcastle Island, SW Five Finger Island, N Departure Bay, Vancouver Island. 49°13' N, 123°55' W.

1959, July 26. ca. 30-35 pair with young on the inner rock, reported by Wm. Merilees and Wm. Hughes (Q), who visited the area for gull-banding.

1960, July 18. K. Vermeer (BCNRS) tallied 38 nests, mostly with young on the same rock.

SNAKE ISLAND, Rainbow Channel, NW Gabriola Island, NE Nanaimo, Vancouver Island, 49°13' N, 123°53' W.

1958, July 27. Wm. Hughes, J. G. Sarles, and A. Muir (Q) reported pelagics nesting on their first gull-banding trip to the area. Sarles banded 15 young; no total count available.

1959, July 26. Wm. Merilees, on the second banding trip, noted about 15 pair nesting (Q).

Cliffs NW shore GABRIOLA ISLAND, on Northumberland Channel, 49°10' N, 123°52' W.

1960, June 8. Nests seen; about 25 pair on rockface, at least 6-7 pair nesting. Wm. Merilees (BCNRS).

VALDES ISLAND, NW corner in Pylades Channel, about 2 miles S Dibuxante Point; the point is 49°07' N, 123°43' W.

1920, '21, '22, '23, and several times since. E. A. Anderson (Q) noted birds roosting here, and probably nesting; he has a photograph from 30's or 40's showing about 25 birds on cliffside.

1939. P. Thornton reported nesting (IMcTC MS).

1955. P. Symons (Q) saw about 6 nests from the water, with adults in attendance.

BARE POINT, Vancouver Island, across bay from Chemainus. 48°56' N, 123°42' W.

1952-59, every year. Birds on cliffside noted, feeding trips observed; seen from wharf opposite. Rev. J. Stainer (Q).

1959, May 28. 50 pair; nests and eggs seen (CJG MS).

BALLINGALL ISLETS, Trincomali Channel, NW Montague Harbour, Galiano Island, just N Wise Island. 48°54' N, 123°27' W.

1936, June 14. Sprot (1936) reported empty nests, freshly made, as follows: 6-8 on N islet, 3-4 on S islet.

1939, August 17 (not August 27 as in M-C: 52). 20 young in 6 nests N islet, 7 young in 3 nests S islet (IMcTC MS).

1959, June 28. Drent (BCNRS) found 6 nests on N islet, 5 on S islet; of these 3 were empty, the remaining 8 had eggs (from 1-3).

CHOCOLATE ISLAND (also called Third Sister), rounded islet just NW Admiral's Island (Second Sister), Ganges Harbour, Salt Spring Island, 48°50' 123°27'.

1945-48. A. Best, who owns a summer home in the harbour, reports that a small colony (8-10 nests) was established here in '45, and kept on through '48; in '45-'46-'47 no mink were seen on the islands following intensive wartime trapping, but in '48 the first sign was seen, and in '49 the cormorants did not nest again, nor have they since.

MANDARTE ISLAND (other names: Bare, Ridge), Haro Strait, E Miner's Bay, central E shore Sidney Island, 48°38' N, 123°17' W.

1891. Fannin (1891) wrote: "Breeds on the islands close to Sidney Island" which beyond all doubt refers to Mandarte; the same statement was repeated by Fannin (1898) and Kermode (1904).

1909, June 25. Eggs collected by W. Burton (PM). Probably the

3 cormorant eggs collected by E. M. Anderson July 10, 1900 (PM), were taken here (see Sidney Island, hypotheticals).

1912, June 20. 2 sets of 5 eggs collected by E. M. Anderson (PM).

1915, June 15-July 28. W. B. Anderson (1916) stationed on the island as warden during this period, estimated 25 pair nesting along the western cliffs. Although he spent the 1916 nesting season on the island also, no counts were published.

1921, May 14. Munro (1925) found 30 birds on the cliffside, not yet nesting; traces of the usual colony site on the NW cliffside were noted.

1923, July 23. On this visit Munro (1925) found nesting in progress; 4 nests with eggs were seen but no total count made.

1927, July 21. Munro (1929) again noted the nesting colony, but made no count.

1931, June 11. 1 set of 2 eggs WSM coll.

1936, July 8. Munro (1937) counted 164 occupied nests.

1955, July 2. The Victoria Natural History Society field group reported about 200 nests (A. R. Davidson).

1957 on. In this season G. F. van Tets commenced his cormorant study, living on the island the summers of '57-'58-'59, and a part of '60. He reports the nesting population to be between 300-400 pair, with no noticeable change in the study period. Available counts are given below.

1959, July 16-29. A nest tally taken by van Tets and Drent (BCNRS) during banding operations gave a total of 357 occupied nests. The only portion of the cliff-face not covered was that immediately below nesting double-crests, where about 15 pair nested; about 375 pair nested in 1959 therefore.

1960, July 31. A total count is not available, but the same two observers tallied 150 nests in the southern stretch of cliff where 128 were found in '59 (BCNRS).

GORDON HEAD, Haro Strait, NE Victoria, SE Cordova Bay, 48°30' N, 123°18' W.

A. R. Davidson who has been observing this colony irregularly in recent years, reports (pers. comm.) that it appeared well established when he first saw it in 1951. He also gives the following records:

1955, June 1. 80 birds present; nest building just commencing.

July 1. 75 nests in 3 places.

August 20. Colony disturbed; only 9 nests left of 26 in one section. Young ranged from downy to full-fledged.

1956, June 24. 45 nests; birds still laying.

1956. Miss E. K. Lemon reported 20 nests on the cliffs just south of here.

1958, June 24. R. Bissenden (BCNRS) tallied 7 nests with eggs; 3 weeks later they were deserted.

1959 and later. Colony maintained at about its usual size (A. R. Davidson).

CHAIN ISLETS, off Oak Bay, E Victoria, between Gonzales Point & Discovery Island, 48°25' N, 123° 16' W.

1924. Pelagics definitely nesting when A. L. Meugens first visited the islets (pers. comm.); at least 15 pair on one of lesser Chains, and 4 on marker (photographs).

1941, July 7. 5 fresh eggs A. L. Meugens coll.

1948 on. C. J. Guiguet, who has been active in the area since 1948, reports that small groups have nested on three rocks of the group, but not on Great Chain itself, and on a nearby marker (Lewis Reef) every season.

1960, June 19. F. A. Gornall (BCNRS) tallied nests and found 70 on the large rock east of Great Chain; none on the latter. Most of the nests were empty, having been freshly made; laying is late here due to frequent disturbance. The rock NNE of Great Chain had 2-4 pair nesting (CJG), but the third NE (Great Chain) had none on this date.

TRIAL ISLAND, E Victoria, S Oak Bay, SSW Gonzales Pt. 48°24' N, 123°18' W.

1956. Although cormorants have roosted here for years, first evidence of nesting was seen in this season (CJG).

1959. D. H. Franklin, lightkeeper, (Q) reported about 50 nests.

1960. D. H. Franklin kept a tally of the colony for us (BCNRS):

June 12 & 19, July 14. Eggs were laid in at least 96 of the total 107 nests, but from the total of at least 327 eggs only 12 chicks were raised.

5. GLAUCOUS-WINGED GULL Larus glaucescens

Nesting Habits

For these notes I rely on my observations on Mandarte Island 1959/60, and on nest record cards representing the same meadow, 92 nests visited daily in 1959 (G. F. van Tets) and 97 in 1960 (my own).

The adult pairs take up territories on the nesting islets (ranging from barren skerries but a few feet above high water to islands a couple of miles long, with patches of shrub and trees; occasionally cliffy areas also utilized) in spring, each pair claiming a parcel of meadow or other open land from which other gulls are chased away. By April most sites are taken up, and a visit shows gulls dotted over all the open areas, white specks against a green background.

Somewhere within the territory a rough saucer of grass-straws is built, both partners working at it, this nest is usually placed in the open, but often built in brush thickets with access by a tunnel through the vegetation when such is offered. Several nests may be constructed and abandoned before the three blotched, mostly greenish-brown eggs are laid, at intervals of 2 days. Clutches of two occur, but many of these are due to loss by marauding crows or even other gulls; most one-clutches can be explained by loss also, but apparently in a few cases only 1 egg is ever laid. The first eggs can be expected mid-May on, but the heaviest laying occurs in the last week of May and the first half of June.

Both sexes brood, incubation taking 27 days (from laying of C egg until C chick is free of shell, 30 obs., range 26-28). By

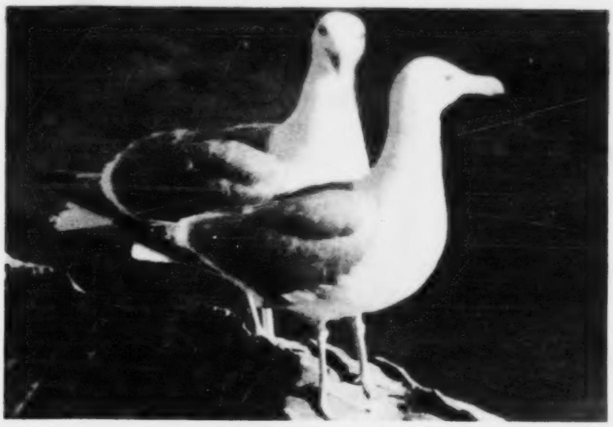

Fig. 22.

Mandarte Island. June 28, 1960. R. Drent. Glaucous-winged gull. Pair on territory, in this case a strip of rocky beach. Large size and combination of pink feet and light grey mantle with grey wing tips usually given as diagnostic, but on south coast separation from herring and western gulls in the field sometimes difficult; note variation in wing tips in this pair.

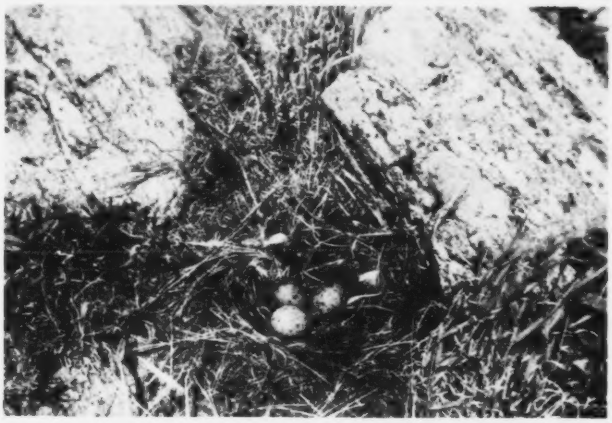

Fig. 23.

Chain Islets. July 7, 1941. A. L. Meugens. Glaucous-winged gull. Nest, a sketchy saucer of grass, with complete clutch of 3 eggs. The eggs are buffy or greenish, with black and brown flecks.

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the time the chicks hatch the grassy meadows are seared dry, and their speckled tawny down makes them difficult to see amongst the brown grass stalks. The first couple of days the chicks remain in the nest, but thereafter scamper off to crouch in the nearest cover as soon as the parents give the alarm, and generally remain immobile until the disturbance is over. The nest has now served its purpose, is neglected, and gradually disintegrates. Restriction of movement is important to the chicks, for if they stray off their parents' territory they will be attacked by neighbouring adults and if they fail to escape will be killed. The parents bring their chicks a great variety of foods, from sea urchins and shellfish, herring, and sandlance to garbage scraps. They feed the young by regurgitation, usually dropping the food onto some convenient rock slab where the chicks gobble it up. The peeping call of hungry chicks can be heard here and there in the meadow all day long, and even throughout the night.

By 35-40 days the chicks no longer hide when disturbed, but fly down to the sea where they paddle about in dense rafts waiting to come ashore again (47 obs.; Schultz 1951 gives 5 weeks). Even younger birds will flee to the water when cornered but rapidly become soaked to the skin. At around 50-60 days the chicks leave the nesting islet and disperse to areas with extensive mud flats, or nowadays garbage dumps, fish canneries, etc., where they can feed on their own (extreme ages seen on island: mean of 4 : 55; ages seen at Vancouver mean of 4 : 60; Schultz 1951 gives soon after 8th week). The young still attempt to beg food from adults, however, and it is even possible that some parents are still with their chicks at this stage. This dispersal movement from the breeding colonies goes on from early August through September.

Season (south coast)

80% of the clutches in both years were started May 23-June 12, but first eggs can be expected a week earlier (15th) and a very few may be laid as late as mid-July (12th) these being mainly replacements. For dispersal of young see above.

Species breeding range (A.O.U. 1957: 218; no subspecies)

From Commander Islands, St. Lawrence Island, western Alaska (Cape Denbigh in Norton Sound, Yukon delta, Hooper Bay, see G&L: 437), Pribilofs, Aleutians, Alaska Peninsula, Kodiak Island (see Murie 1959: 165-171), and SE Alaska (chief colony Forrester) south along the coast to NW Washington (San Juan Islands, Cape Johnson & Copalis Rock on the open coast). A North Pacific gull, strictly a coastal nester.

British Columbia sites

The glaucous-winged gull is the only gull nesting in salt-water localities in British Columbia; and it nests nowhere else, i.e. it is strictly coastal. The rather similar herring gull, on the other hand, is known to nest only on interior lakes in British Columbia; thus these two gulls show no overlap in breeding distribution in this province. The same general distinction (salt water versus fresh water) seems to hold for these two in Alaska, but there are two published reports of herring gulls nesting on coastal islets there (see G&L: 442-443: Muir Island, Glacier Bay, and Forrester). The mew gull (short-billed), the third nesting gull in British Columbia, is another fresh-water nester (Broomfield Lake, Princess Royal Island, Guiguet 1953).

The glaucous-wing nests throughout our coastline. The sites given here reflect the degree of exploration for the various areas. Colonies vary from 2000 pair down to several; and a single pair may nest successfully. It has been suggested that where one to several pair are found nesting in marginal sites, pressure of numbers at the usual colonies is making itself felt. I believe, however, that the "isolates" are a normal thing for the glaucous-wing, this gull nesting wherever certain conditions are met, regardless of how many pair the site will accommodate. I have been at pains to include a number of records of less than 6 pair together in all manner of situations in the Queen Charlottes, to demonstrate that these "overflow sites" are not a feature of the south coast only.

LANGARA ISLAND, QCI (old name North Island), off NW tip Graham Island

1930, end June-mid-July. A few pair nesting on cliffs and on moss pads in spruce trees in the interior, according to Cumming (1930).

1947, July 1. 2 sets of 3, WSM coll. Nesting in scattered pairs on pinnacles along southwest coast between Henslung and Cox 1946/47 and 1952 (CJG MS).

Langara Island Light, Langara Pt., (Cape Santa Marguerita)
NW tip of island, 54°15' N, 133°04' W.

E. A. Hartt, lightkeeper there since 1957, furnishes the following counts; nests, eggs, and young being observed:

1957 ca. 150 pairs

1958 ca. 200 pairs
1959 ca. 50 pairs

COX ISLAND, QCI, Cloak Bay, SW shore Langara Island. 54°12' N, 133°01' W.

1946, June 16. About 12 adults, apparently nesting; nests subsequently observed (CJG MS).

"GRASSY" OR "GREEN" ISLET, QCI, unnamed on charts, between Morgan Pt. and White Point off NW coast Graham Island, ca. 3 mi. N Frederick 53°59' N, 133°08' W.

1920's. Hodgson reported nesting to Patch (1922).

1946, June 21. Birds on territory (CJG MS).

1947, June 27. ca. 40 nests found, all still with eggs; 4 sets of 3 coll. by WSM, incubation just commenced (CJG MS).

TIAN ISLETS, QCI, E Tian Head, W boundary Tian Bay, central west coast Graham Island. S most islet: 53°45' N, 133°05' W.

1947, July 7. Several nests found, all empty (CJG MS).

POWELL ISLAND, QCI, Masset Inlet, NW Makai Pt., 53°41' N, 132°22' W.

1960, June 15. 3 nests with eggs, the total for this island. J. B. Foster, BCNRS.

BALCH ISLANDS, QCI, Bearskin Bay, N Maude Island, S Queen Charlotte City, Skidegate Inlet. 53°14' N, 132°05' W.

1947, July 13. 1 nest with 3 eggs (CJG MS).

GOODEN & MAPLE ISLANDS, QCI, Bearskin Bay, just off Queen Charlotte City, Skidegate Inlet. G: 53°15' N, 132°04' W; M: 53°14' N, 132°03' W.

1946, August 3. 7-8 pair nesting on Maple, 1 pair on Gooden (IMcTC MS).

Rock off Skidegate Mission, SE tip Graham Island, QCI, at E entrance Skidegate Inlet; either TORRENS or JEWELL ISLAND, approx. 53°15' N, 131°59' W.

1946, August 1. Nesting colony noted (IMcTC MS).

GILLATT ISLAND, W Sandspit, Skidegate Inlet 53°15' N, 131°54' W.

1947, July 15. 30 nests found, all empty; young had presumably hatched although none were found. A large colony (CJG MS).

MAMIN ISLETS, QCI, Juskatka Inlet, S Masset Inlet, Graham Island, 53°38' N, 132°19' W.

1960, June 15. 1 nest with eggs, J. B. Foster BCNRS.

REEF ISLAND, QCI, Hecate Strait, SE Louise Island, 52°52' N, 131°31' W.

1960, July 4. 9 nests, 6 with eggs, 3 with young; J. B. Foster BCNRS.

Rock off HASWELL ISLAND (called Entrance I.), off SE tip Louise Island, entrance to Selwyn Inlet, 52°52' N, 131°41' W.

1946, July 31. Colony noted, young seen. IMcTC

Islet in HOUSTON STEWART CHANNEL (between Moresby and Kunghit Islands)

1900, July 3. Fresh eggs and young just hatched Osgood (1901).

KEROUARD ISLANDS, QCI, Cape Saint James, S end Kunghit Island 51°55' N, 131°00' W.

1958, June 21. 7 nests with eggs S. Shearman BCNRS.

GREEN ISLAND, E Dundas Island, Chatham Sound; islet adjoining lightstation.

1920. J. Moran, lightkeeper, mentioned gulls nesting in an account of killer whales (Moran 1924); this must have been in the period 1919 (first stationed there) to 1923 (last observation in account).

1957. Mrs. V. Bigelow, lightkeeper's wife, reports (Q) 60-80 pair nesting that season, nests, eggs, and young observed.

1958. I passed by the island many times July-August; the gulls again nested.

Unwooded and unnamed islet, 1 mile south TRIPLE ISLANDS, NW Tree Nob Group, Brown Passage, ca. 20 miles W Prince Rupert. 54°17' N, 130°53' W.

1950, July 1. At least 25 pair nesting, nests with eggs noted; G. C. Odlum (Q).

LUCY ISLAND, Chatham Sound, 12 miles west Prince Rupert, 54°18' N, 130°36' W.

Listed in M-C: 116, nesting presumed.

GANDER GROUP, unnamed islet W of channel between the main Moore Islands (and W Anchorage), Hecate Strait, W Aristazabal Island, 52°40' N, 129°26' W.

1936, June 6. Nests with eggs (McCabe MS).

BURIAL ISLAND, bay at New Bella Bella, 52°10' N, 128°07' W.

1959, May 31. Eggs found (CJG MS).

FINGAL ISLAND, McMullin Group, N Goose Island, S Princess Alice Island, 52°05' N, 128°28' W.

1948, August 4. Guiguet (1953) reported a colony of some 30 pair here; 15 nests examined: some empty, eggs pipping in 3, young in remainder: from newly hatched to 3/4 grown (CJG MS).

GOSLING ROCKS, S Goose Island Group (S Gosling Island), Queen's Sound. centre: 51°52' N, 128°27' W.

1948. About 150 pair nested in the Goose Islands, the majority here, as follows (Guiguet 1953):

May 17. on territory

May 27. Nests, but no eggs yet.

June 8. First eggs, 2 nests with total of 3.

August 3. Eggs, downy young, and juveniles.

MOSQUITO ISLETS, Kildidt Sound, SW part Hunter Island, 51°50' N, 128°10' W.

1939, July 9. 30-40 pair nesting (IMcTC MS).

Unnamed islet W TABLE ISLAND, next to outermost in string of rocks off NW shore; SW Ann Island, Loran Pass, Entrance to Smith South, 51°16' N, 127°49' W.

1937, July 5-9. Nests prepared; adults excited but no eggs found (McCabe MS).

TREE ISLETS, Queen Charlotte Strait, just NE Pine Island, 50°59' N, 127°43' W.

1929. One pair nesting according to Young (1930) who was in the area June 1-18.

DESERTER'S ISLAND, Deserter's Group, E Walker Group, Ripple Passage in Queen Charlotte Strait, mid-point 50°53' N, 127°28' W.

1929. 2 eggs brought to Young (1930) sometime in the same period.

Rocks to south of DOYLE ISLAND; Gordon Islands Group, Queen Charlotte Strait at S end Gordon Channel 50°48' N, 127°28' W.

1939, June 14-24. McCabe's 1939 photograph file includes 2 of nests with eggs here (#24 & 26); details in journal lacking; in the area this period.

(Sea Bird Bluff, entrance to Telburg Channel, opposite Alert Bay, listed in M-C: 116 as presumed site, cannot now be located.)

TRIANGLE ISLAND, outermost of the Scott Islands lying W Cape Scott, N tip Vancouver Island, 129°05' N, 50°52' W.

1913, July. Eggs collected by Dr. C. F. Newcombe (PM).

1949, June 24-July 1. Eggs, ready to hatch, found by the Museum party; gulls were nesting on all of the rocky shores visited (Carl et al. 1951).

SARTINE ISLAND, next in line of Scott Island to E, 50°49' N, 128°54' W.

1950, June 21-22. Nesting (Carl et al. 1951).

BERESFORD ISLAND, still further E in Scott Islands, lying to W of Lanz, 50°27' N, 128°46' W.

1950, June 20-22. Nesting; eggs noted. (Carl et al. 1951).

GILLAM ISLAND, SE Cliffe Point, Quatsino Sound, 50°27' N, 127°58' W.

1958. Nesting according to Bamfield residents (G. F. van Tets MS); confirmation desirable.

SOLANDER ISLAND, off Cape Cook, Brooks Peninsula, NW coast Vancouver Island 50°07' N, 127°56' W.

1954, June 29-July 3. Nesting (Guiguet 1955).

BUNSBY ISLANDS, reefs to south of, off Ououkinsh Inlet, in Cautious Pt., Malksope Pt. area, approx. 50°05' N, 127°30' W.

1955, August 4-10. Adults with flying young (Carl & Guiguet 1956).

GRASSY ISLAND, Barrier Group, outside Kyuquot Channel, Kyuquot Sound, NW coast Vancouver Island, 49°55' N, 127°15' W.

1958, June 28. Nesting (CJG MS).

CLARK ISLAND, W Grassy as above; 49°55' N, 127°14' W.

1958, June 28. Nesting (CJG MS).

N Vargas Island, SW Chetarpe Point, Calmus Passage, Clayoquot Sound; either MONKS ISLET or rock immediately north; locally called White Rocks; 49°14' N, 126°01' W.

1930, May 31. 25 nests prepared; no eggs yet (IMcTC MS).

CLELAND ISLAND (called Bare), NW Vargas Island, S Brabant Channel, Clayoquot Sound, central west coast Vancouver Island, 49°10' N, 126°05' W.

1930, May 9. Holding territory; no nests yet.

May 22. 150-200 pair estimated (IMcTC MS).

1959. Reported to nest by Indians, per Mrs. Waldon (Q).

BAERIA ROCKS, Imperial Eagle Channel near head, Barkley Sound, NW Tzartus Island, 48°57' N, 125°09' W.

1958. Nesting reported by Bamfield people (G. F. van Tets, MS).

1960, July 18. A. R. Wooton passed by the rock cluster this date, obviously a nesting colony; his slide shows about 50 pair on three rocks (examined Dec. 12, 1960).

SEABIRD ROCKS, off Pachena Bay, SE Cape Beale, NW Pachena Point, SW coast Vancouver Island. 48°15' N, 125°09' W.

1943, August 19.
1945, August 11. Theed Pearse (1946a) carried out gull banding on this island on both dates; colony size not given.

RACE ROCKS, Strait of Juan de Fuca, S Metchosin District, SE Bentinck Island, 48°18' N, 123°32' W.

1924, July 23. Munro (1925) visited North Race Rock, and found 75 pair with young, the majority 4 weeks old; 3 nests still had eggs.

1958, July. Several rocks lying N and W of Great Race (which has the lightstation), presumably including North Race, were found to have small nesting groups, a total of about 150 nests being found. G. C. Odlum (Q).

Great Race Rock.

G. C. Odlum, lightkeeper here since 1953, has observed nesting each season, and has contributed extensive nest records to the BCNRS, covering the same part of the colony (east half of islet, or about 2/3 of total) each season, his notes running from egg-laying to hatching.

1956. 120 nests, total colony about 150.
1957. 122 nests, total colony about 175.
1958. 133 nests, total colony about 175.
1959. 100 nests, total colony about 140.
1960. 101 nests, total colony about 140.

Such an accurate record over a 5-year span is unusual, and provides an interesting comparison with Christie Islet, Howe Sound: Race Rocks, free from unwanted human intrusion by its remote location, and without nesting crows, has been roughly stable over the period covered; Christie, heavily disturbed, may now be on the decline.

MITLENATCH ISLAND, Strait of Georgia, SW Hernando Island, NE Oyster River on Vancouver Island. 49°57' N, 125°00' W.

1896, June 18. Dawson collected eggs here this date (Cooke 1915).

1922, July 29-31. 250 pair estimated by Pearse (1923), who has been gull banding on Mitlenatch off and on from 1921 to 1949.

1925, July 25. Banding trip.

1927, July 15. M-C (116) give 27 nests with eggs and young (visit by Munro).

July 16-18. Pearse (1929) carried out a nest tally as follows:

72	nests with 3 eggs
50	nests with 2 eggs
20	nests with 1 egg
8	nests with eggs chipping, or young
150	total

He comments on the very low production for such a large colony.

1928, August 13. Pearse (1929) has described his banding trips to the island on these dates (1925, '27, & '28), and estimated 400 pair nesting, with no noticeable change in the period covered (1925-28). Further trips were made including 1943, '46, and '49 (see Pearse 1956) but no counts supplied.

1959, July 20 & August 10. Nests, eggs, and young examined; estimated 600 pair breeding. D. Stirling (Q).

1960, July 6-7. 62 nests tallied, eggs and young; est. 1200 pairs total. D. Stirling BCNRS.

July 28. Wm. Merilees (BCNRS) estimated the colony at 900 pair on his gull banding trip.

BLUFFS 1/2 mile east St. John's Point, Tribune Bay, Hornby Island, 49°31' N, 124°36' W.

1938. Gulls nesting, ca. 30 pair (Pearse 1956).

1940-46. Mr. G. E. Seon, resident in Tribune Bay at that time, remembers gulls nesting on the bluffs.

1960, July 10. Mr. G. E. Seon and 2 other observers visited the bluffs by boat, no nests could be seen from the water but 70 adults counted.

SISTERS ISLETS, Strait of Georgia W Lasqueti Island, 49°29' N, 124°26' W.

1940-43. O. S. Dean, lightkeeper over that period, observed gulls nesting each year (observed nests, eggs, young); he estimated the colony at 100 pair at that time (Q).

1951. Mrs. A. G. Waldon, lightkeeper's wife, noted about 100 pair in the colony this season; young were successfully raised (Q).

BALLENAS ISLAND, N cliffs of N islet, Strait of Georgia N Nanoose Harbour, 49°21' N, 124°09' W.

1952-56. Mrs. Waldon, who lived on Ballenas following Sisters, observed about 50 pair nesting each of these seasons (nests, eggs, young) (Q).

FRANKLIN ROCKS and MERRY ISLAND, Welcome Pass, off Sechelt Peninsula, S. Halfmoon Bay, 49°28' N, 123°55' W.

1950, April. Adults on territory; mating observed. c. 700-800 pair. J. A. Brooks, Fisheries Guardian (Q).

1950-60. G. H. Potts (Q) lightkeeper here, reports nesting on Franklin Rock and small groups on Merry Island over this period; in 1960 500 or more pair on Franklin and about 100 on Merry, the latter in two groups.

WHITE ISLETS, Strait of Georgia, S Wilson Creek P.O., SE base of Sechelt Peninsula. 49°25' N, 123°43' W.

1923, August. Nesting (juveniles seen), IMcTC MS.

1939, July 15. Nests with small young, and a very few with eggs; photos show adults, nests, and c. 2 weeks' old young (A. Wootton pers. comm.)

c1935 on Nesting; the Merilees family have paid visits to these islets off and on through the years, the latest being July 1958 when juveniles were noted (Wm. Merilees, Q).

CHRISTIE ISLAND (Centre; Cynthia), Howe Sound, S. Irby Point, S. tip Anvil Island 49°30' N, 123°18' W, and PAM ROCK (White Rock), S Christie, 49°29' N, 123°18' W.

c1914. Mr. Hugh C. Christie of Vancouver has kindly supplied me with the following notes (Feb. 15, 1960). He bought the island from a German, Mr. Stolperfuss, roundabout 1914 when the government seized the latter's property. Gulls were nesting on the islet then. Mr. Christie named the island as a memorial to his father, a hardy west-coast Scot, as the rugged lonely islet symbolized his character. It was formerly called Centre Island, and has also received the name Cynthia, but Mr. Christie's designation has been accepted as official.

1926-31. Kenneth Alexander banded 225 young here in this period (Sprot 1937).

1941, May 31. 1 set of 3 eggs (1/3 incub.) WSM coll. (Christie).

1948. Mr. Wm. Hughes first visited the island this year, and has returned practically each season with other members of the Western Bird Banders' Association for gull banding, starting 1949.

1949, June 15. 2 sets of 3 eggs, WSM coll. (Christie).

1955, June 26. 247 nests tallied (Christie), eggs and young. Wm. Hughes, BCNRS.

1956, June 10. 30 nests examined (Christie), 1-3 eggs each, no young; on Pam Rock 7-8 nests examined, and 10 pair est. A. L. Meugens and J. K. Cooper (Q).

June 26. 419 nests tallied (Christie), eggs and young; Wm. Hughes BCNRS.

1958, June 22. 219 nests tallied (Christie), eggs and young, Wm. Merilees and G. M. McKay, BCNRS.

1959, June 21. 299 nests tallied (Christie), eggs and young, same 2 observers, BCNRS.

1960, July 15. 56 juveniles banded. Wm. Hughes.

PASSAGE ISLAND, S tip and rock immediately S; NW Atkinson Point, E Bowen Island, Queen Charlotte Channel of Howe Sound, 49°21' N, 123°18' W.

1958, June. Young noted at both localities, J. Toochin (Q).

July 22. S tip: 16 nests with eggs and young tallied, A. Muir (BCNRS, Q) and J. G. Sarles (Q).

1959, May 31. S tip passage: nesting, J. Toochin (Q).

S. Rock: 38 nests with fresh eggs tallied; colony est. at 50 pair as egg-laying still in progress. J. Toochin (BCNRS &Q).

HUDSON ROCKS, Horswell Channel, NE Horswell Bluff, N Departure Bay; and FIVE FINGERS ISLAND, NE of Hudson Rocks, 49°13' N, 123°55' W.

1958, June. Nests seen; weather prevented landing. J. G. Sarles (Q).

1959, July 26. Five Fingers (outermost): 5 nests with eggs. Hudson Rocks: 75 pair with juveniles. Wm. Merilees (Q).

1960, July 18. Hudson Rocks: young from 1/2 - 3/5 grown, K. Vermeer (BCNRS).

SNAKE ISLAND, Rainbow Channel, NW Gabriola Island, NE Nanaimo, Vancouver Island, 49°13' N, 123°53' W.

(1947) Listed by Munro and Cowan (1947).

1958, June. Nests found, counted 300-400 pair. J. G. Sarles (Q).

July 27. 313 young banded, J. G. Sarles (Q).

1959, July 26. ca. 500 pair noted on next banding trip, some young flying already, Wm. Merilees (Q).

1960, May 5. 225 adults on territory, S half of island; a nesting population of 300-400 pair reasonable. R. Drent.

BALLINGALL ISLETS, Trincomali Channel, NW Montague

Harbour, Galiano Island, just N Wise Island. 48°54' N, 123°27' W.

1936, June 14. Sprot (1936) found 50 nests on N islet, 35 on S; all with eggs; about 200 adults were present.

1939, August 17 (not August 7 as in M-C: 116). Young found (M-C: 116; IMcTC MS).

1959, June 28. 35 nests on N islet (mostly eggs) and 22 on S islet, one only with young, tallied; R & J. J. Drent, BCNRS.

JAVA ISLETS, Boundary Pass, E Taylor Pt., W Monarch Head, SE shore Saturna Island, 48°46' N, 123°07' W.

1900 on. H. Spalding of South Pender Island can remember about 30-40 pair nesting here when he first started making visits to the area (about 1900); they have nested ever since; specifically, P. Symons (Q) has noted nesting every year 1946-1959.

1959, June 27. 158 nests tallied on N islet, 214 on S islet, total 372 nests with eggs and newly hatched young (only 10 old enough to band); virtually a complete tally: R., J. J., & J. Drent, BCNRS.

1960, August 27. Drent's banding visit this season was late, most young flying at this time; 10 banded.

IMRIE ISLAND, Prevost Passage, S Seymour Pt., Moresby Island, 48°42' N, 123°20' W.

1905, June 21. Dawson and Edson visited Imrie this date, but apparently found no nesting sea birds (Edson 1929).

1927 on. R. Mathews of Tsehum Hbr., Sidney, remembers gulls nesting here ever since he started small boat work amongst the islands.

1929-34. Banding here and on Mandarte carried on by G. D. Sprot (Sprot 1937).

1935, August 2. 150 pair plus young, given in M-C: 116 (visit by Munro). .

1938-40. 699 young banded by Dennis Ashby (Woodbury & Knight 1951: 58).

1945, May 27. 3 fresh eggs ALM coll. Meugens noted many other nests, freshly prepared, but laying had only just begun; he has a photograph taken this date showing 150 adults on the northern half of the islet.

1957-58. G. F. van Tets noted nesting in both seasons, making several visits to the islet.

1959, June 28. 168 nests tallied, eggs and newly hatched young; total of 200 estimated as the long grasses growing over much of the island made a complete tally impossible (3 obs. 1 hr.), R., J. J., & J. Drent, BCNRS.

1960, June 19. 270 nests were tallied: only 1 had young; total for the island estimated at 290-300 (3 obs. 3 hrs.), R. Drent, F. Tompa, K. Vermeer, BCNRS.

MANDARTE ISLAND, Haro Strait, E Miner's Bay on central E shore Sidney Island, 48°38' N, 123°17' W.

1900, June 14 & 16. eggs (PM)

1902, June 15. eggs (PM)

1908, June 24. 3 eggs, collected by F. Kermode (PM).

1910, June 16. 3 eggs, same collector (PM).

June 18. 3 eggs collected by W. Burton (PM).

1915, June 15-July 28. Anderson (1916) stationed on the island as warden through this period estimated 225 pair nesting, "a small number compared to...20 years ago."

1921, May 14. Munro (1925) estimated 350 mated pair; egg-laying had not yet started.

1923, June 23. 200 nests with eggs examined, and the total estimated at 600 (Munro 1925).

1927, July 21. Munro (1929) found about 1000 pair, an increase of 400 over 1923; 100 nests were examined, mostly with newly hatched young. Perhaps his estimates for this season are too high (cf. 1936); his puffin count on this visit also seems remarkably high.

Fig. 24.
August 5, 1960.
R. Drent. Mandarte.
Glaucous-winged gull: nesting meadow late in season, grass seared dry. The young are hiding under grass clumps, beneath stones, etc., hence not visible.

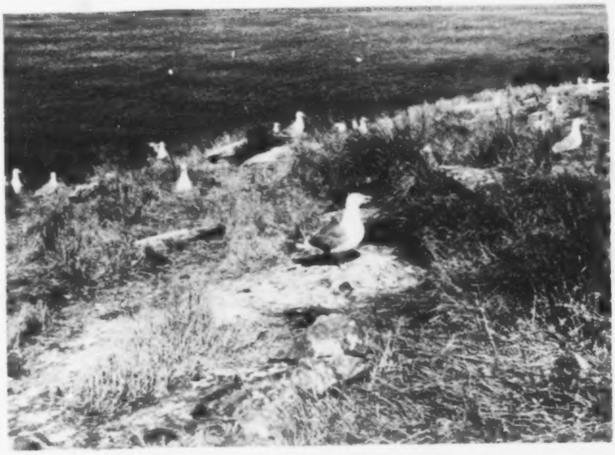


Fig. 25.
August 19, 1960.
R. Drent. Mandarte.
Glaucous-winged gull: nesting meadow near close of season, each family on its own territory. Young here (35-40 days) will fly down to the sea when disturbed. Note brush fringe in background.

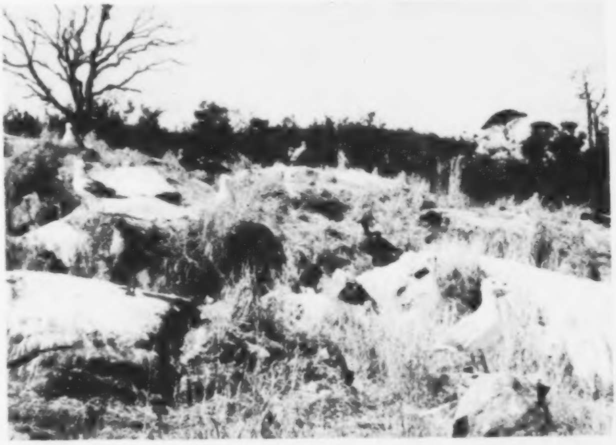
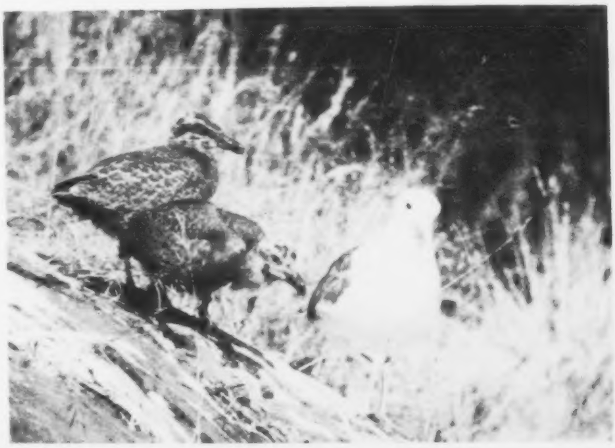


Fig. 26.
August 5, 1960.
R. Drent. Mandarte.
Glaucous-winged gull: adult with its 2 young, c. 35 days old. The chick at right leans forward to beg food from parent, which rests on one foot.



1932, June 25. 2 sets of 3 eggs (well incubated) WSM coll.

1936, June 12. 2 sets of 3 taken, fresh to just commenced, WSM coll.

July 8. Munro found 534 nests with eggs and young (listed in M-C) and gave the colony as "some 500 pair" (Munro 1937).

1955, July 2. 1500 nesting pair estimated by the Victoria Natural History Society group (per A. R. Davidson).

1957-60. G. F. van Tets and other UBC bird men have lived on Mandarte every summer in this period, and place the present breeding population at about 1800-2000 pair, with no noticeable change in the period.

CHAIN ISLETS, off Oak Bay; E Gonzales Pt., W Discovery Island, 48°25' N, 123°16' W.

1924. Nesting when A. L. Meugens (pers. comm.) made his first visits to the islands.

1941, June 1. 3 fresh eggs, ALM coll.

1955, July 17. Nests, eggs and young observed, total of 1000 pair estimated. D. Stirling (Q).

1960, May 29. 78 nests inspected (10 empty, rest with eggs), estimated total for colony at this date 200, total pair 700. Stirling, Stirling & Webb BCNRS.

June 19. Greater Chain: 45 nests tallied, all but 3 with eggs; estimate total at 500. Rock SE: 25 nests tallied, the total; eggs only. Rock due W (nest N from other): 36 nests tallied, est. 50 total; eggs only. Grand total for Chain Islets group roughly 700-1000 pair. F. A. Gornall, BCNRS.

TRIAL ISLAND, E. Victoria, S Oak Bay, SSW Gonzales Pt. 48°24' N, 123°18' W.

1948. Nesting at the time of first visit here (CJG MS).

1953, June 11. 50 pair nesting (CJG MS).

1959. D. H. Franklin, lightkeeper, reported (Q) that about 50 pair nest each year.

1960. Miss June Franklin carried out observations on the nesting gulls throughout the season and submitted records for 46 nests (BCNRS).

"ISOLATES" NESTING ON SOUTH COAST

Up to 4 pair at a site; not entered on maps.

1. Vancouver area:

Wigwam Inn, Indian Arm

Early 1940's: 1 pair nested on a piling here 3 consecutive seasons. W. Hughes (Q).

Lion's Gate Bridge, Vancouver Harbour: S most piling

1958: 2 downy young seen, must be nesting there. J. Toochin (Q).

Foot of Prospect Point, Stanley Park

1959. 2 pair nesting; nests seen from boat enroute to Christie. W. Hughes (Q).

Siwash Rock, Stanley Park

1958. Young seen by binoculars, 3-4 pair nesting, E. Moody via J. Toochin (Q).

Cliff 2 miles N Horseshoe Bay, Howe Sound

1956, July 16; 1957, June 15. 1 pair nesting. A. Muir (Q).

2. Victoria area:

Single rock just S Croker Point, 10-15' off beach, Saturna Island

1955, July. 2 pair nesting. K. Wade (Q).

Blunden Island, off SE tip South Pender Island

1-2 pair occasionally nest. H. Spalding (Q).

10 Mile Point, N. Victoria

1960. 1 pair nesting. Mrs. A. M. Fouracre (PM records).

Esquimalt, 70' up on derrick in naval yard

1958. 1 pair nesting. Cmdr. P. F. Fairfull (PM records).

Sooke Bay, several small rock islands (Strait of Juan de Fuca).

1960. 2 nests with young tallied. J. A. Brooks (BCNRS).

6. COMMON MURRE Uria aalge

Nesting Habits

These are extremely social birds, and breed in dense crowds on the narrow ledges of steep cliffs, or on level open areas on the clifftop; on Triangle Island nesting amongst grass tussocks on the crest of headlands was noted (CJG MS), cf. Rausch (1958) for similar sites on Middleton Island. Although sometimes these barren areas may receive some protection from an overhang, they are usually open to the weather. Here mating takes place, and the single intricately blotched egg is laid, on the bare rock. Perhaps the variable pattern helps the parents to recognize their egg among the many strewn along the ledge, but often the eggs become very soiled, and position may afford the main clue (see Johnson 1941 for pattern, Norrevang 1958 for position). The parents share incubation (equally according to Uspenski 1956), standing upright, generally facing in to the cliff, their backs to the sea, with the egg, supported by their tarsi, snuggled against the brood-patch.

The egg hatches in about 32 days (Uspenski 1956 in 1958 ed.: 77), and the young is fed fish by the parents until about 16 days old (Keighley & Lockley 1947) when, urged by the parents or at least highly excited adults, it flutters down to the sea on its own, and departs from the colony area accompanied by one or more adults (see Norrevang 1958, and Fisher & Lockley 1954). The age at which the chick finally becomes independent is unknown.

Season in British Columbia

Data insufficient. Egg-laying apparently begins in late June.

Fig. 27.
Pt. Reyes. I. McT. Cowan. Common murres & Brandt's cormorant nesting in California. The murre, long-necked and with a long sharp bill, in summer has clear white underparts with all-black head and back & small white wing stripe; the only similar bird, the thick-billed murre, is seen in B. C. in winter only.

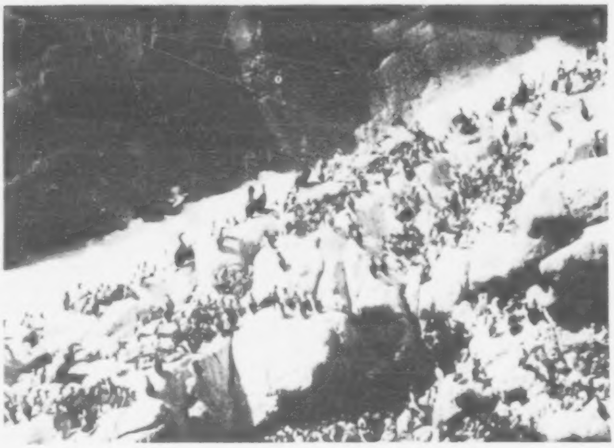


Fig. 28.
Pt. Reyes. I. McT. Cowan. Common murre. Another view of the same California colony. Banding has shown that adults return to the same nest-site year after year, generally tend only their own egg and later feed only their own chick; only in this way can reproduction in such dense mobs be successful.

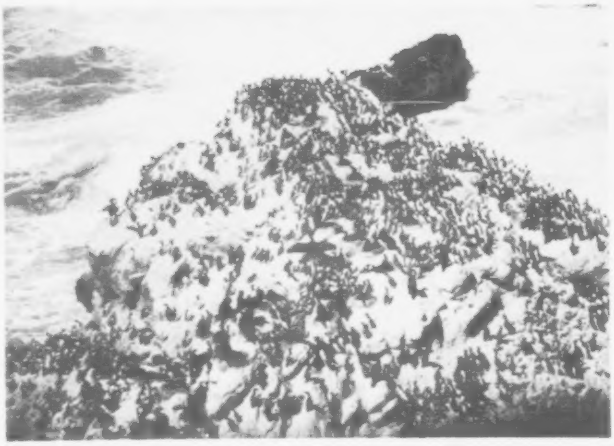
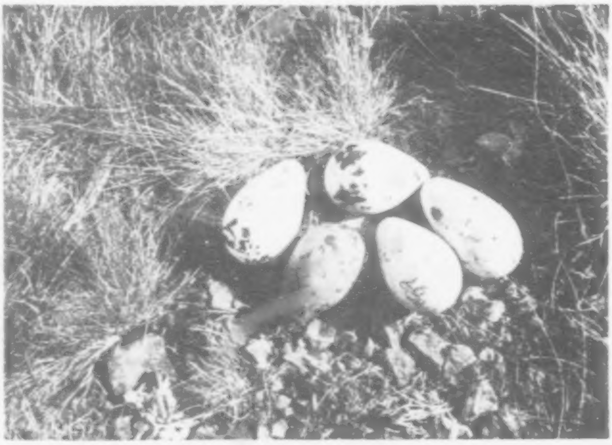


Fig. 29.
June 28, 1949. G. C. Carl. Triangle Island. Common murre; eggs taken from the colony to show variation in shape & markings. Recent study has shown that adults learn to recognize their own egg and nest-site.



Species breeding range (A.O.U. 1957: 246-247, Alexander 1959: 131-132)

Pacific: from south of Bering Strait to Sakhalin, eastern Korea, northern Japan; and on the east shore to central California.

Atlantic: SW Greenland, Labrador & Quebec to Newfoundland & Nova Scotia; Spitzbergen, Iceland, Shetlands, Faeroes, U.K., Norway, islands in Baltic, Helgoland (Germany), France & Portugal.

Subspecies breeding range U.a. inornata (A.O.U. supplemented by G&L: 476)

From St. Lawrence Island and Norton Sound area (Sledge Island, Cape Denbigh), St. Mathew and Nunivak Islands, Pribilofs, throughout the Aleutians (Murie 1959: 182-183) on west through Commander Islands to Kamchatka, the Kuriles, southern Sakhalin, eastern Korea and Hokkaido; and east along S shore Alaska Peninsula, Kodiak Island, Cook Inlet, islets off Kenai, Middelton Island (Rausch 1958) to Alexander Archipelago (St. Lazaria, Hazy Islands, Forrester) south through British Columbia.

British Columbia

There is but one documented colony in the Province; in the Scott Islands. Records of supposed colonies elsewhere will be found in the hypothetical list.

TRIANGLE ISLAND, outermost of the Scott Islands, lying W Cape Scott, the N tip of Vancouver Island. 50°52' N, 129°05' W.

1900, June 20. 4 eggs collected by W. Burton (PM: Guiguet 1950).

1909, July 13. 4 eggs collected by C. F. Newcombe & W. Burton (PM: Guiguet 1950).

July 15. 1 egg collected by W. Burton (PM: Guiguet 1950).

1920. 1 egg, C. J. Young (ROM)

1949, June 24-July 1. The Museum party collected 19 eggs (9 of these are now in the WSM coll., and 1 in the ALM coll., all taken June 29) from a group of approximately 200 pair on the cliffs of the SW peninsula; all of the eggs collected were fresh, and no downy chicks were observed. Thus egg-laying had just begun, and probably the vast number of birds seen roosting on various points about the island would later breed; this would bring the nesting population to about 1500 pair. (Guiguet 1950; Carl et al. 1951)

7. PIGEON GUILLEMOT Cepphus grylle (see below)

Nesting Habits

I rely on my work on Mandarte Island 1959/60 (M.A. thesis, UBC, in preparation) for the following comments.

Although these birds return to their nesting areas in late April, no eggs are laid for another month. Through May, especially in the early morning hours, they congregate on the rocky beaches of the headlands, islets, and skerries where they nest. From time to time the guillemots make flights up to the nest site of former seasons: rock crannies, gaps or chambers beneath boulders, deserted rabbit burrows, even burrows that they have themselves excavated (see Guiguet 1953 for such a type in B. C.), chinks under driftwood heaps, and so on; in short, any sort of cavity where the birds can more or less creep out of sight. Here the birds tear out obstructing grasses, scrape out the floor, and shape rock chips or shell fragments that happen to lie about into a crude depression; that is their only nestmaking effort. Contrary to the gulls, whose nests lie within their territories, guillemot territories are modest portions of the beach boulders where they haul out in their free time, and are only large enough for a pair to sun themselves upon. It is here that mating takes place.

In the little chip-strewn basin in the nest-cavity two speckled (black, purple, and brown blotches on a white to pale green ground colour) eggs are laid, an interval of three days between them. Sometimes only 1 is laid, but clutches of 3 are likely the work of two females using the same nest. Both parents incubate, and within any one day both will have a time on the eggs; it is unclear what share each sex takes however. The bird stays on the eggs through the night without a break, but during the day incubation is in stretches of 2 hours (average in undisturbed conditions; unusual record 6), broken by perhaps 5 minutes' bathing and preening on the water, then the bird flies back up to the eggs. After a variable number of such stretches the mate flies in from

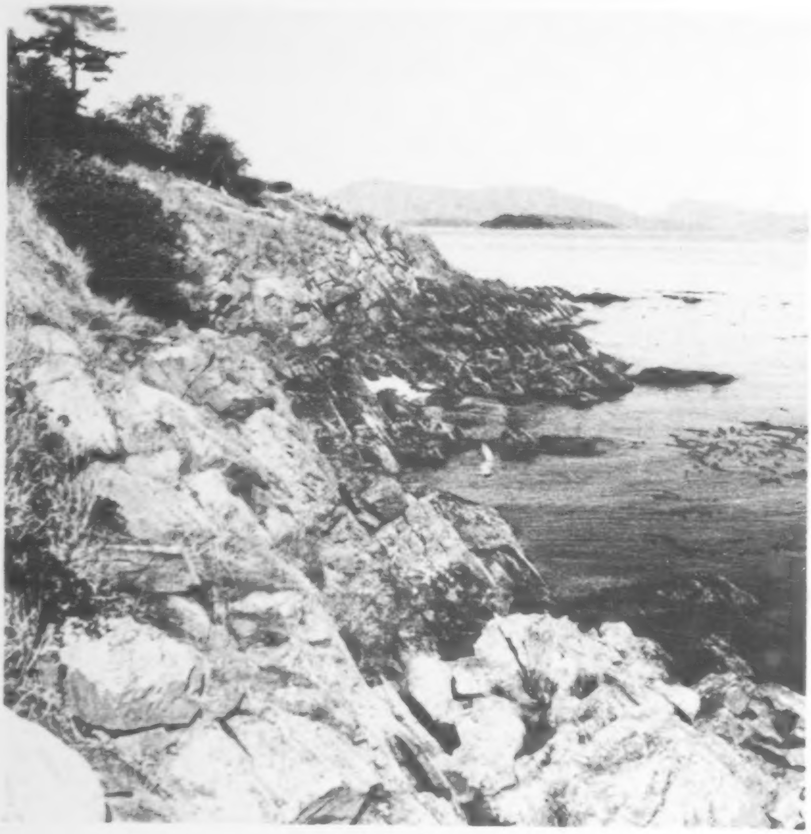


Fig. 30.

Mandarte Island. August 31, 1960. R. Drent. Pigeon guillemot: nesting terrain on NE shore, looking north. 11 nests were found along this stretch of broken rocky beach. The picture was taken in the late morning at the close of the season, hence no adults are present on their beach boulder territories. Gulls nest along the open portion of the cliff margin; a juvenile takes flight in centre.

- - - - - - - - - - - - - -

the feeding grounds and an exchange takes place. If the incubating mate has been at the nest long, the exchange may be immediate, otherwise a half hour or more may elapse before the incoming bird is allowed to take over. In undisturbed conditions the eggs are never allowed to cool for more than these short breaks of 10 minutes at most, at any time of the day.

Incubation lasts 30 days (from laying of B egg until B chick is free of shell, mean for 11, range 28-32), and at first the chicks are brooded at night at least until 4-5 days old. The young are fed in the nest for about 35 days (mean of 15), when they leave for the sea. Both parents feed, flying to the nest with a single fish at a time dangling from the bill (blennies, sculpin, small flatfish, etc.). Each chick receives roughly 10 fish a day, all delivered in the daylight hours. The chicks never leave the nest cavity until their juvenal plumage is complete, when they bumble their way down to sea and leave the nesting area at once; this probably occurs chiefly by night. From that point on the young have nothing to do with the parents, who continue to haul out at the nesting area in the morning hours until the colony breaks up in September, when all young have taken to the sea.

Season (south coast)

The first eggs can be expected in the last week of May, but the period of heavy laying is in June, with a few stragglers laying in early July; 80% of clutches started between June 5-26 both seasons. Young start to come down to sea at the close of July, and by the first week in September practically all are gone.

Species breeding range (A.O.U. 1957: 249-251)

N.B. I prefer to follow Salomonsen (1944) in ranking our guillemot as a subspecies in a holarctic chain; thus this section corresponds to Cepphus grylle and columba of the A.O.U.

Eastern Arctic Canada (Ellesmere, Devon, Somerset islands, Melville Peninsula, and east shore of Hudson Bay to James Bay, on eastwards, cf. map Snyder 1957: 237), N. Quebec, Labrador, on down the Atlantic seaboard to Maine; both coasts of Greenland, Iceland, Faeroes, N & W Scotland, N & W Eire; N shore of Baltic; Norway, Spitsbergen, Franz Josef Land, Novaya Zemlya, Severnaya Zemlya, New Siberian, Wrangel, and Herald islands; status on Alaska's N coast unclear, possibly breeding east to Canadian territory; in Pacific from Bering Sea to California on the American side, and to Kamchatka and the Kuriles on the Asian (for general map see Fisher & Lockley 1954: 274).

Subspecies breeding range (C. grylle columba; C. c. columba of the A.O.U.)

From Chukotski Peninsula and Diomede Islands to southern Kamchatka, and from St. Lawrence, St. Matthew, Hall and Bogoslof islands, eastern Aleutians (to Biorka on Unalaska;

gives way to C. g. kaiurka in western Aleutians) Shumagins, Kodiak, and SE Alaska S to Santa Barbara Island, S. California.

British Columbia sites

The pigeon guillemot is not strictly a colonial species; to a greater extent than the other sea birds here treated it can be found nesting 1-2 pair by themselves, in all situations that offer nesting cavities of any sort or soft banks for burrowing. Thus almost every rocky headland or isolated islet or skerry up and down the coast will be found to harbour a few guillemots in the breeding season providing they are free of land predators such as mink. On those islets where the more specialized demands of the other sea birds are also met, the guillemot forms a familiar component of the breeding population, the size of the "guillemot colony" depending on the numbers of nest-sites available. Since it is such an ubiquitous bird, most investigators content themselves with noting nesting in a few representative localities, and concentrate on other birds. The following is therefore but a sample; nor would there by much point in attempting "complete" coverage for any but a rather small area.

LANGARA ISLAND, QCI, (old name North Island) off NW tip Graham Island.

1926, June 15. Numerous along western shore, first eggs laid this date (Young 1930).

1930, July 17. Very common, 6 nesting adults taken this date (Cumming 1930).

1946. Nesting groups noted throughout; particularly on headlands either side of Henslung Cove; Ageria Bay, Andrew's Point, and Langara Point (CJG MS).

1947, June 10. First eggs taken this date (no time for search 1946) (CJG MS).

July 4. 1 small downy young taken in Langara Point colony (CJG MS).

1952, May 17. Breeding concentration (30-50 ad.) noted S McPherson Point; breeding on south shoreline (headlands either side of Henslung particularly) as usual (CJG MS).

Fig. 31.
June 3, 1960.
R. Drent. Mandarte.
Pigeon guillemot: pair billing on territory. Summer adults are charcoal black, feet and mouth lining coral red, bill black; the broad white wing patches are diagnostic.

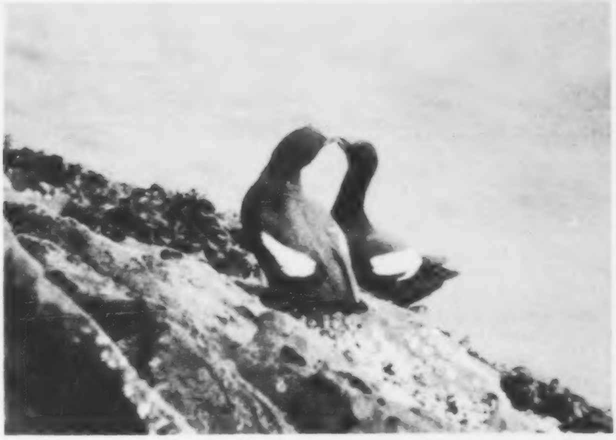


Fig. 32.
June 28, 1960.
R. Drent. Mandarte.
Pigeon guillemot nest site. The 2 eggs can be dimly seen below A, in cavity beneath boulder jumble just above highwater mark (note barnacles).

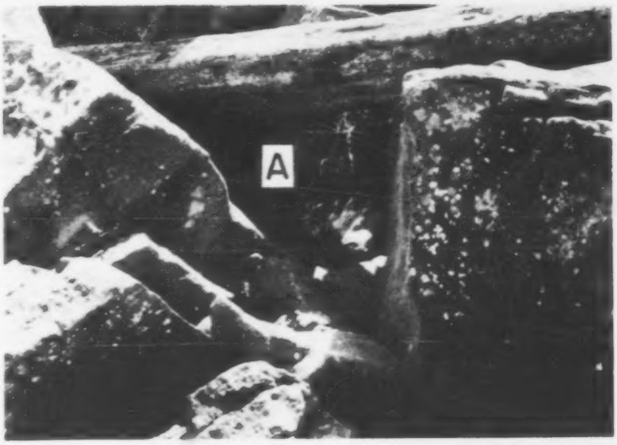
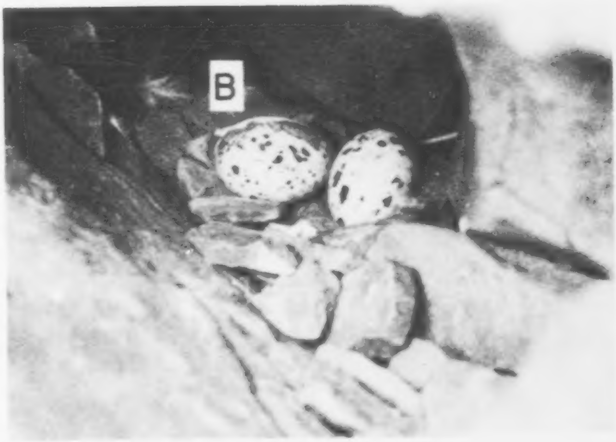


Fig. 33.
June 28, 1960.
R. Drent. Mandarte.
Pigeon guillemot: close-up of eggs shown at A above (white to pale green speckled with variety of dark shades). The complete clutch of 2 nestles in depression of chip floor. At B sensitive tip of probe taped to the egg for temperature measurements.



LUCY ISLAND, QCI, Solide Passage, S Dadens on Langara Island. 54°11' N, 132°59' W.

1926, June. Broken eggshells found (Young 1930).

1946, June 28-29. Common along western shore--nest along this stretch somewhere (CJG MS).

1952, May 17. Breeding concentration (50-75) N side (CJG MS).

"GRASSY" or "GREEN" ISLET, QCI, unnamed on charts, between Morgan Pt. and White Pt. off NW coast Graham Island, ca. 3 miles N Frederick Island. 53°59' N, 133°08' W.

1947, June 27. 2 nests with eggs found: 1 & 2 eggs (CJG MS). The set of 2 (incubation just commenced) in WSM coll.

FREDERICK ISLAND, QCI, off NW shore Graham Island, 53°56' N, 133°10' W.

1946, June 21-25. Nesting along all rocky shores in burrows under roots of conifers (CJG MS).

TIAN ISLETS, QCI, E Tian Head, forming west boundary Tian Bay, central W coast Graham Island, N islet: 53°46' N, 133°05' W; S islet: 53°45' N, 133°05' W.

1947, July 7. About 25-30 pair nesting (CJG MS)

MAPLE ISLAND, QCI, Bearskin Bay, just S Queen Charlotte City, Skidegate Inlet. 53°15' N, 132°03' W.

1946, August 3. Several pair nesting; deep burrows excavated, 1 containing 1 young about ready to leave the nest (IMcTC MS).

HELGESEN ISLAND, QCI, Boomchain Bay, off Englefield Bay, NW coast Moresby Island, 53°02' N, 132°26' W.

1959, June 13 & 15. Nesting; burrowing at the cliff-edge here (CJG MS).

LIMESTONE ISLANDS, QCI, N Vertical Point, S Skedans, Louise Island, 52°54' N, 131°37' W.

1946, August 19. About 50 pair nesting on north face, a sandstone cliff; feeding going on, adults flying in and out of nesting holes (IMcTC MS).

GIL ISLET, QCI, Darwin Sound, SE Lockeport, Moresby Island, 52°43' N, 131°48' W.

1946, August 18. Small colony (10-12 pair), on this tiny islet (IMcTC MS).

MOORE ISLANDS, harbour in SE corner largest of this group, Hecate Strait, W Aristazabal Island. 52°41' N, 129°25' W.

1936, June 2. 40-50 pair at least nesting here, adults seen flying in and out of nesting holes (McCabe MS).

Rocks at south end of COOPER ISLAND (local name) near Bella Bella; approximately 52°10' N, 128°05' W.

1959, May 29. Nesting (CJG MS).

GOOSE ISLAND GROUP, Queen' s Sound.

1948 Guiguet (1953) made the following observations:

June 7--first egg
July 6--adults first seen carrying feed to young
August 6--young first seen on water

Total breeding population for the group estimated at 500 pair.

MOSQUITO ISLETS, Kildidt Sound (SW shore Hunter Island), 51°50' N, 128°10' W.

1939, July 4. Eggs taken (M-C: 122); probably this colony.

July 9. Noted nesting here (IMcTC MS).

Cove on SE shore ANN ISLAND, in passage N Table Island, entrance to Smith Sound, 51°16' N, 127°48' W.

1937, June 5-9. Abundant; 40-50 adults here, seen flying in and out of nesting holes in columnar rock about 10-15' above highwater mark (McCabe MS).

PINE ISLAND, Queen Charlotte Strait, 50°59' N, 127°43' W.

Fig. 34.
June 28, 1960.
R. Drent. Mandarte.
Pigeon guillemot: another nest site, at cliff crest: small chamber hollowed from rocky soil beneath boulder lettered 4. Pelagic cormorants have plucked all grass from the vicinity.

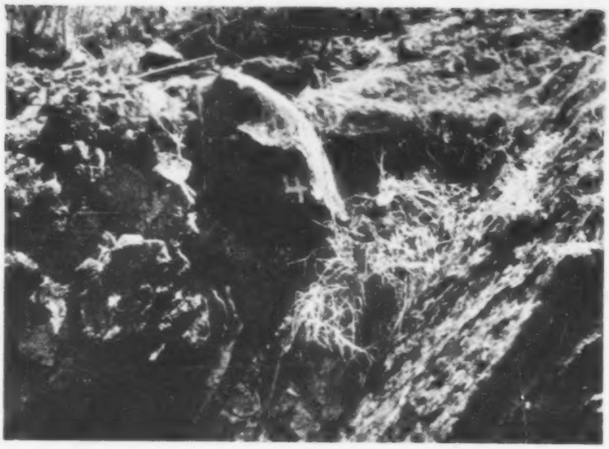


Fig. 35.
June 28, 1960.
R. Drent. Mandarte.
Pigeon guillemot: nest site higher up on the slope; cranny in rock mass, entrance just to left of torch.

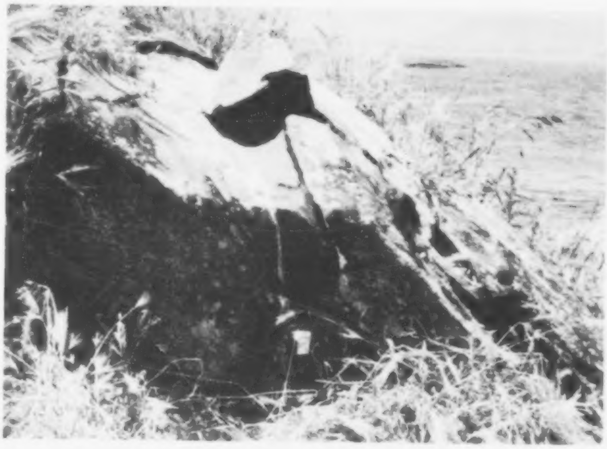
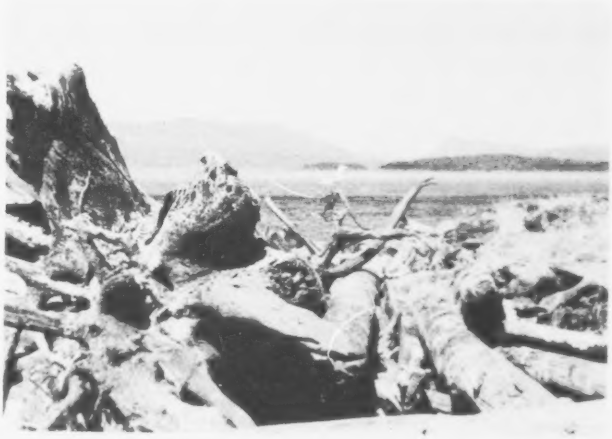


Fig. 36.
August 8, 1960.
R. Drent. Imrie Island.
Pigeon guillemot: nest site in beach debris. 2 young in cavity below and to right of gull; entrance parents used to left, below entire jumble.



1915-1933. P. C. Pike (Q) remembers many nesting in the period he was lightkeeper here.

1929. June 3. Young (1930) reported egg-laying had just commenced, 2 nests with 1 egg and 1 with 2 eggs being found this date.

TRIANGLE ISLAND, outermost of the Scott Islands lying west of Cape Scott, the N tip Vancouver Island. 50°52' N, 129°05' W.

1949, June 24-July 1. The Museum party observed courtship and copulation and found freshly prepared nest sites, but no eggs (Carl et al. 1951).

SARTINE ISLAND, next in line of Scott Islands to E, 50°49' N, 128°54' W.

1950, June 21-22. Nesting (CJG MS).

BERESFORD ISLAND, still farther E in Scott Islands, lying to W of Lanz, 50°27' N, 128°46' W.

1950, June 20-22. Nesting (CJG MS).

SOLANDER ISLAND, off Cape Cook, Brooks Peninsula, NW coast Vancouver Island, 50°07' N, 127°56' W.

1954, July 1. Guiguet (1955) found guillemots nesting in small numbers.

Reefs SE AMOS ISLAND, E end Mission Group, S McKay Cove, W Union Island, outside Crowther Channel, Kyuquot Sound. 50°01' N, 127°21' W.

1957, July 20. Nesting (CJG MS).

CLARK ISLAND, W Grassy Island, in Barrier Group, outside Kyuquot Channel, Kyuquot Sound, 49°55' N, 127°15' W.

1958, June 28. Nesting (CJG MS).

CLELAND ISLAND (called Bare), NW Vargas Island, Clayoquot Sound, S Brabant Channel, 49°10' N, 126°05' W, central W coast Vancouver Island.

1930, May 9. Courtship in progress

May 22. 150 birds counted; no eggs yet (IMcTC with K. Racey MS).

RACE ROCKS, Strait of Juan de Fuca, S Metchosin District, SE Bentinck Island, 48°18' N, 123°32' W.

1924, July 23. Munro (1925) visited North Race for gull-banding, and suspected a few guillemots to nest there (adults hanging about).

1953-59. G. C. Odlum, lightkeeper, has found eggs and young, and estimates (Q) roughly 20 pair nesting on Great Race every season.

MITLENATCH ISLAND, Strait of Georgia, SW Hernando Island, NE Oyster River, Vancouver Island. 49°57' N, 125°00' W.

1922, July 29-31. Pearse (1956) estimated 250 pair breeding, an increase over 1920 when he first made notes here.

1927, July 15. Young (M-C: 122).

1940 onwards. Pearse (1956) still found about the same number (250 pair) nesting but by 1946 only few were found; Laing reported very few in 1955.

1959, July 20 & August 10. Feeding of young going on; 200 adults present (D. Stirling, Q).

1960, July 6-7. Again Stirling (BCNRS) found feeding in progress, and estimated 175 pair to breed (careful tally of adults present).

July 27. Although chiefly concerned with gull-banding, Wm. Merilees (BCNRS) readily found 3 nests (2x2 yng, 1x1 yng) and estimated the colony at 170 pair.

ST. JOHN POINT, Hornby Island, bluffs on Tribune Bay side, 49°31' N, 124°36' W.

1922. Pearse (1956) estimated 100 pair breeding here.

1955, June 7. The same observer reported less than 10 adults

Fig. 37.

July 24, 1960.
R. Drent. Mandarte.
Pigeon guillemot: downy young taken from nest with 2 eggs for comparison. One chick is one, the other two days old; one has crawled behind the other seeking escape from the light.

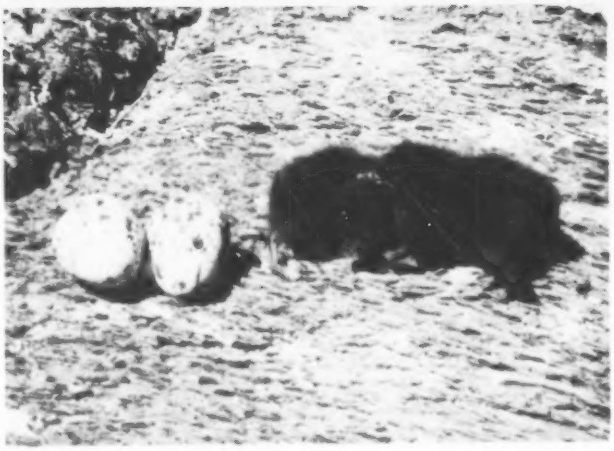


Fig. 38.

July 18, 1960.
R. Drent. Mandarte.
Pigeon guillemot from nest 4 (cf. Fig. 34), 28 days old. Note egg-tooth, still prominent. The bird has been banded.

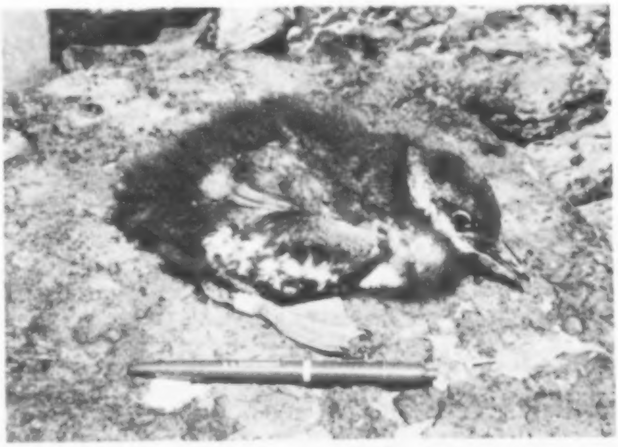
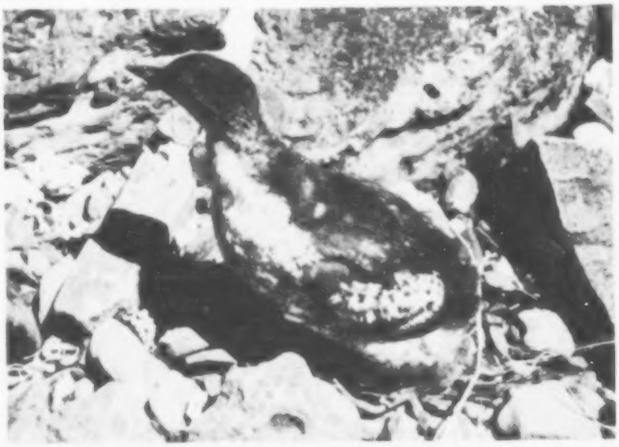


Fig. 39.

July 24, 1960.
R. Drent. Mandarte.
Pigeon guillemot: the same young at 34 days old; juvenal plumage complete, traces of down adhering. At this age active, making frequent escapes, but safely returned to nest. Left for sea 4 days later.



seen this date, and concluded that this colony had also undergone a sharp decline as at Mitlenatch.

1952, 1953, 1957. The Rev. J. Stainer (Q) has noted adults entering their nest sites here (inaccessible) and found broken egg shells; numbers few, colony scattered.

BALLENAS ISLANDS, north cliffs of N islet, Strait of Georgia, N Nanoose Harbour, Vancouver Island. 49°21' N, 124°09' W.

1952-56. Mrs. A. G. Waldon (Q), lightkeeper's wife, noted approximately 10 pair nesting each of these seasons; young were found in the nest cavity.

DANIEL POINT region, S entrance Agamemnon Channel, outside Pender Harbour, Sechelt Peninsula. 49°38' N, 124°04' W.

1959. about 20 pair nesting in cliff here, R. Valentine (Q).

CHRISTIE ISLET (other names Centre & Cynthia; cf. account under gull), Howe Sound, S Irby Point S tip Anvil Island, 49°30' N, 123°18' W.
and PAM ROCK (also called White Rock), S Christie, 49°29' N, 123°18' W.

1943, June 10. 2 eggs WSM coll.

1945, June 1. 2 fresh eggs ALM coll.

1948-60. Wm. Hughes made his first trip to the island in 1948 and has banded gulls from 1949 on, with other members of the Western Bird Banders' Association. He reports (Q) Christie to support ca. 50-60 pair and Pam about 8-10 pair, with no noticeable change through the period. Nests inspected and counts by others given below.

1950, June 11. W. S. Maguire (MS) estimated 50 pair nesting on Christie.

1952, July 21. 57 young banded on Christie by Wm. Hughes (Q).

1955, June 26. 11 nests examined on Christie, 4 with young; 7 with eggs. Wm. Hughes and R. E. Boston (BCNRS).

1956, June 10. 3 nests with 2 eggs each examined on Christie;

8-10 pair estimated nesting on Pam (A. L. Meugens & J. K. Cooper, Q).

June 26. 8 nests examined on Christie, 7 with young, 1 with eggs (Wm. Hughes, BCNRS).

1959, June 21. 1 nest with 2 eggs inspected by Wm. Merilees (BCNRS); A. Muir (Q) noted young this date; both on Christie.

BATCHELOR POINT cliffs, Queen Charlotte Channel, Howe Sound (N Eagle Harbour). 49°22' N, 123°17' W.

1953 to 1959. Wm. Hughes (Q) has noted adults flying to their nests in these seasons, when enroute to Christie.

PASSAGE ISLAND, NW Atkinson Point, E Bowen Island, Queen Charlotte Channel of Howe Sound, 49°21' N, 123°18' W.

1922, July 22-23. Racey (1922) found downy young, and estimated 10 pair nesting.

1948, June 7. 8 pair nesting; fresh eggs found (IMcTC MS).

1958, June. About 6 pair nesting; 3 nests inspected, all with eggs (J. Toochin, Q).

1959, May 31. Several crevices checked; no eggs yet, but adults about. (J. Toochin, Q).

SIWASH ROCK, west shore Stanley Park, promontory from Vancouver into Burrard Inlet, 49°19' N, 123°09' W.

1958-59. A single pair has nested each season; in '58 1 young died, in '59 2 young were successfully raised. Observed by E. Moody by telescope (J. Toochin, Q).

SNAKE ISLAND, NW Gabriola Island, NE Nanaimo, Vancouver Island. 49°13' N, 123°53' W.

1959, July 26. 1 young found in nest cavity beneath driftwood heap, Wm. Merilees (BCNRS).

VALDES ISLAND, cliffs about 3 miles S Dibuxante Point NW tip, on Pylades Channel; point is 49°07' N, 123°43' W.

1920, '21, '22, '23 & several times since; latest 1958. About 50 pair nest along this stretch; adults seen flying to nests (E. A. Anderson, Q).

GALIANO ISLAND, cliffs c. 3 miles from N end, W side just N Shaw's Landing. 48°59' N, 123°34' W.

1920, '21, '22, '23. A large group nesting here (possibly 100 pair), E. A. Anderson (Q).

BALLINGALL ISLETS, Trincomali Channel, NW Montague Harbour, Galiano Island, just N Wise Island. 48°54' N, 123°27' W.

1936, June 14. Sprot (1936) suspected 1 pair to nest here.

1959, June 28. 6 pair definitely nesting, but nest search not undertaken because of cormorant colony (R. Drent, BCNRS).

ELLIOT BLUFF, SW shore Saturna Island, NW Croker Pt., S Payne Pt., 48°47' N, 123°13' W.

1959, August. ca. 30 pair nesting along this rocky stretch (63 adults counted, IMcTC MS). One nest visible from water, 1 young successfully raised (R.W. Pillsbury, Q).

JAVA ISLETS, Boundary Pass, E Taylor Point, W Monarch Head, SE shore Saturna Island, 48°46' N, 123°07' W.

1959, June 27. 2 nests found (with eggs), 1 on each islet (R., J., & J. J. Drent, BCNRS).

1960, August 27. 1 nest on N islet (deserted egg) and 4 on S islet: 2x2 yng, and in 2 young had already left; estimated total for both: 6-8 pair (R. Drent, BCNRS).

IMRIE ISLAND, Prevost Passage, S Seymour Pt., Moresby Island, 48°42' N, 123°20' W.

1959, June 28 & July 19. 4 nests found total; on latter date 2 eggs, egg & chick, 1 chick, and 2 small downies were the contents (R. & J. Drent and J. & A. Koskimies, BCNRS).

1960, June 19, July 18, and August 8. Effort was made to locate all nests: 8 were found. On the latter date all held young save 1 (deserted). (R. Drent, K. Vermeer, F. Tompa, and G. F. van Tets, BCNRS)

MANDARTE ISLAND (also called Bare, Ridge), Haro Strait, E Miner's Bay on central E shore Sidney Island, 48°38' N, 123°17' W.

Egg records in PM collections: 1902, June 14 - 2
1907, June 24 - 2
1908, June 16 & 24
1910, June 20 - 3

1915, June 15-July 28. W. B. Anderson (1916) warden on the island this period, estimated 200 pair nesting.

1921, May 14. Munro (1925) estimated 40 pair present, but found no occupied burrows this early in the season.

1923, July 23. On this visit Munro (1925) found ca. 150 pair nesting; 5 nests with 2 eggs each were found after a brief search.

1927, July 21. (14 July yng Munro in M-C: 122) Munro (1929) noted a definite decrease, the whole colony having shrunk to about 40 pair; investigation showed many adults had died 3 weeks to 1 month earlier, their carcasses lying about the nest site and littered over the open ground. No explanation could be found. Unfortunately Munro recorded no numbers for his 1936 visit.

1957-60. G. F. van Tets and his assistants in '57-'58 and R. Drent with the help of other observers in '59-'60 have made special search for nests throughout these summers, so that by Sept. 1960 practically all had been located: 3 on rock to N, 80 on Mandarte itself, and 19 on rock to S; total 102, breeding population estimated at 100-110 pair, which agrees with counts of adults. No marked change was observed in the period. (Records in BCNRS).

DISCOVERY ISLAND, S entrance Haro Strait, E Oak Bay, centre is 48°26' N, 123°14' W.

1927, July 14. Munro collected downy young (M-C: 122).

CHAIN ISLETS, off Oak Bay, W Discovery Island, E Gonzales Point, 48°25' N, 123°16' W.

1941, June 15. Fresh eggs (ALM coll.).

1950-53. Nesting annually; SE side Greater Chain Island (PM).

1955, July 17. Adults feeding young; total of 45 adults counted in group, 20 of them about Great Chain (D. Stirling, Q).

1960, May 29. Est. 14 pair nesting on Great Chain (based on count of adults) Stirling, Stirling & Webb, BCNRS.

8. MARBLED MURRELET Brachyramphus marmoratum

Nesting habits

Little is known of the nesting behaviour of this bird. Discovery of the egg in the nest where situation and identity are absolutely certain has yet to be made. The only eggs whose identity is indisputable are those taken from the oviducts of females about to lay. At least 17 eggs have been discovered upon dissection of females taken in the spring; table 1 summarizes these records. But few of these eggs, however, are far enough advanced to give much idea of appearance; one of these few was taken in British Columbia.

In the lack of definite information on nesting habits we must rely on clues alone. We here attempt to assemble the fragmentary evidence uncovered bit by bit by ornithologists throughout the Pacific Northwest, grouped under: a) nest discoveries, and b) discoveries of nest fugitive young; the merits of this information are indicated in c) conclusions.

a) Nest discoveries

So far as can be ascertained there are only 3 records of eggs discovered at the nest that may prove to be authentic (Dunham's egg, cited in Bent, is considered questionable by G&L: 488; supposed B. C. records are discussed in hypothetical section). The first of these (1925) was made by E. J. Booth when he found an egg of unusual appearance in the office of a logging camp; questioning revealed that the egg had been found on a bed of moss, no nest being apparent, on June 19, 1925, near Saxon on the south fork of the Nooksack River, Whatcom Cty., Washington. The site was in wooded country about 15 miles inland. The egg was preserved; incubation was found to be about 1/3 advanced (Anonymous 1927, often given as Booth 1927; cf. Edson 1935 and Jewett et al. 1953). The weaknesses in this record are: 1) nest described at second hand, 2) although Bowles and Brown, well-known oologists in Washington, examined the egg and considered

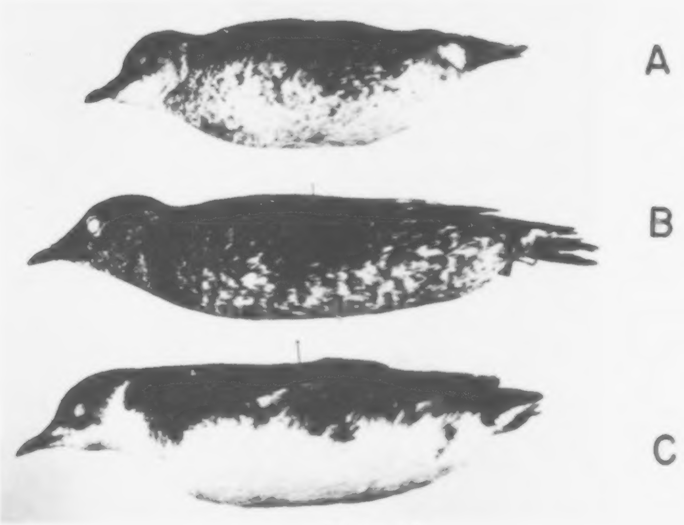


Fig. 40.

Photo: PM

Marbled murrelet: museum skins of A) young recently out of the nest; brown and white; note conspicuous egg-tooth; B) summer adult, a mottled russet brown; C) winter adult, black and white; the white wing stripe distinguishes it from the ancient murrelet, similar in this plumage.

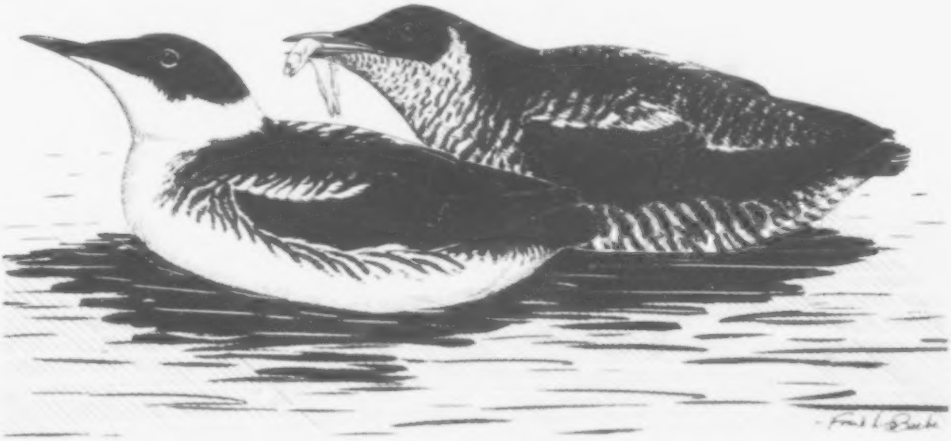


Fig. 41.

Pen and ink by F. L. Beebe

Marbled murrelet: to show appearance of live bird. Winter adult in foreground, note white stripe above wing (cf. above). The mottled brown summer adult (rear) is resembled only by Kittlitz murrelet, not occurring in B. C. When approached it usually dives with a flick of the wings, rather than takes flight. This bird holds a fish in the manner typical when feeding young at the nest; at dusk it will flit away to the still obscure nesting grounds.

identification correct "beyond reasonable doubt," we read (anon. 1927) that the colour is "entirely unlike that of any of the known Murrelet eggs". Comparison with the several certain eggs taken since would seem desirable.

The second record (1931), and the only one where an ornithologist saw the nest site, was made by Stanton Warburton, Jr., in SE Alaska. The only published reference that I have found is a summary in G&L: 488. Mr. Warburton has kindly written me details of his remarkable discovery (in litt. 3.xi.60). Mt. Doolth, on Chichagof Island, Alexander Archipelago, is a rocky mountain rising steeply from the sea to over 2000'. Warburton had frequently seen murrelets flying down from high altitudes at dusk, and determined to search the area. Accompanied by E. R. Osborn (engineer at Chichagof Mine) Warburton and his wife were working up the mountain at 1900', well above timberline, on the evening of June 13, 1931, when Osborn (who preceded the others) cried "murrelet, murrelet." In the dusk Warburton and his wife could not see the bird as it whizzed out to sea. The single egg lay on a bit of moss in a rockslide, but out in the open in full view; at the site a few down feathers were found: all of these were collected (egg, moss, down). Warburton later found that the egg was close to hatching, and thus impossible to blow properly; he entrusted it to J. Bowles of Tacoma, who had to open the egg to remove the chick; unfortunately the contents were not preserved. The egg is now in the Puget Sound Museum of Natural History, Tacoma (G. Alcorn, Director, in litt. 18.x.60).

The only question in this case is whether the nest of the marbled or Kittlitz murrelet was involved. The nesting habits of Kittlitz murrelet (Brachyramphus brevirostre), a purely Alaskan form, (Wrangell in Alexander Archipelago to Cape Prince of Wales and possibly to east of Point Barrow the presumed breeding ground A.O.U. 1957: 253) are equally obscure (see G&L: 490-491, Murie 1959: 188-190) but this case would fit the known facts (range, season, and nest site). Warburton followed up the clue of the down feathers to try to settle this point, and states that Dr. Grinnell compared these with samples from specimens in the Museum of Vertebrate Zoology, Berkeley, and concluded they were from the marbled rather than Kittlitz murrelet. The final step to settle the issue, viz., comparison with indisputable eggs of both species, has yet to be taken. Warburton is anxious that this be done so that his data can be accepted unreservedly; certainly whichever species is decided upon, his has been a fundamental discovery.

TABLE 1: Eggs of the Marbled Murrelet, taken from oviduct.

No.	Description	Collector	Locality	Date	Sources
	SOUTHEAST ALASKA				
1	fully formed but broken; also several small ova from other birds	Cantwell	Howkan, Long Island off Dixon Entrance	May 23, 1897	Cantwell 1898, Bent 1919, etc.
1	pea-sized	Willett	Wrangell	April 15, 1920	Willett 1926
1	ready for shell; had already laid an egg	Bailey	Wrangell	April 23, 1920	Bailey 1927: 13-14
1	ready to be laid	Bailey	Glacier Bay	June 12, 1920	Bailey 1927: 13-14
1	1.15" diam.	Willett	Craig	May 16, 1921	Willett 1926
1	full size but soft shell	Willett	Craig	May 15, 1922	Willett 1926
1	fully formed	Jewett	Off Pleasant Island Glacier Bay	July 13, 1941	Jewett 1942; G&L: 488
	BRITISH COLUMBIA				
2	1 more than 1", other less than 1/2 formed; from same bird	Stewart	Harrison Lake	Apr. 28, 1928	Brooks 1928
1	fully formed; Mitlenatch searched, no birds found	Sutton	Off Mitlenatch Island	May 23, 1934	Sutton & Semple 1941 figured plate 19; listed as Comox by M-C: 123
--	ova up to 15 mm. diam.		Swanson Bay	May 6-23, 1936	Dickinson 1953: 155
	WASHINGTON				
5	2 birds with 2 eggs each; 1 with 1 & bare brood patch	Cantwell	Off mouth of Columbia, Wash. / Ore	May 10-18, 1918	Taylor 1921, Jewett & al. 1953: 322
1	nearly full-sized; 1" diam.	Brown	Pierce Cty.	May 23, 1914	Rathbun 1915: 461; Jewett & al. 1953: 323

The third (1953) nest discovery, near Masset in the Queen Charlotte Islands, has been recorded by Guiguet (1956). About June 4, 1953, Walter Feyer, a reliable bird-watcher of Masset, and well-known to Guiguet, found an adult and broken egg shells in the forest, and at once wrote the Provincial Museum (4.vi.53). Unfortunately Feyer was at odds with the only scientific naturalist in the area, R. Stewart, and told him nothing; Stewart was only able to piece the story together later, when personal confirmation was no longer possible. Stewart's letter (14.vi.53) to Guiguet provides details of the find (Feyer learned nothing further, in litt. (PM) 24.vi.53).

About June 4 Feyer and another man felled a large mossy hemlock close to the beach about 1/2 mile east of Masset. From the debris an adult marbled murrelet was taken, dazed but alive. Feyer recognized the bird, and immediately searched for a possible nest. Egg shell fragments were found, with blood in them, indicating advanced incubation. The actual nest site could not be determined, however. Feyer then entrusted the live adult to a "go-between" who took it to Stewart, asking that it be preserved as a skin. Stewart declined, explaining that the bird was protected by law; he gave the bird "a good once over..to me it looked as if it was a male" and released it. The next day Stewart met Feyer's companion and heard the story just related; all too late. Feyer sent his egg shell fragments to the Provincial Museum, however, and Guiguet was convinced they were genuine.

Opportunity was recently offered to verify identity of Feyer's egg fragments. Dr. I. McT. Cowan (UBC) took the specimen to Washington, D.C., where he was able to make careful comparison with the indisputable eggs of Cantwell and Jewett (see Table 1) as well as with a large series of ancient murrelet eggs (December 8, 1960). Dr. Cowan reports that ground colour, speckling, and texture of the Feyer fragments make designation of marbled murrelet absolutely certain.

b) Discoveries of nest fugitive young (often termed "flightless")

There are three Oregon records:

1. 1918, September 8 (Jewett 1930, Gabrielson & Jewett 1940: 314; G&L: 489)

A small male just out of the down was picked up dead on a road along the upper north fork of the Siuslaw River, about

6 miles inland (Jewett 1930; given as 12 miles in G&L) from Hecata Head Lighthouse (near Minerva), Lane County; this is densely wooded country. The bird was picked up by A. B. Johnson who presented it to O. Dowell, Jr., in whose collection Jewett found it.

2. 1933, September 4 (Jewett 1934)

S. Jewett's son and another 16-year-old boy discovered an immature bird, egg-tooth present, among the tangle of second-growth fir, alder, wild blackberry, etc., in a logged-over area about 1 mile from the sea, near Devil's Lake, Lincoln County; the boys reported that about a dozen breast feathers of the adult were found in the near vicinity.

3. 1940, July 22 (Barber 1941)

A young bird was found at the base of a cliff 25 miles inland from Coos Bay up the south fork of the Coos River; it was kept alive until August 2 when it apparently choked on a piece of clam in its food.

There are also three British Columbia records:

1. (No date, prior to 1923) (Brooks & Swarth 1925, Brooks 1926)

Brooks reports that a young bird, unable to fly and partially covered by down, the primaries in sheaths at their bases, was captured by hand in a fresh-water marsh close to the sea at the foot of a steep brushy hillside, by a boy, whose father (Sydney Williams) gave it to Brooks. Another young was reported to be with it. The locality is somewhat obscure, given as "Gardner Canal" (1925) and as "at Gil-te-gee, near Lowe Inlet" (1926). Possibly Gilttoyees Inlet, 18 miles NNW of the mouth of the Gardner Canal, and 31 NE of Lowe Inlet, was meant. No date was given.

2. 1941, July 23 (Munro & Cowan 1947: 123)

Dr. I. McT. Cowan (pers. comm.) was called by a resident on Allison Road, close to the University of British Columbia campus on Pt. Grey, Vancouver, who had picked up an unusual bird in her garden. Cowan investigated and found that the bird was a live marbled murrelet young, egg-tooth present and some down adherent; it is now #478 (juv. male) in the UBC collection. The site was within 1/2 mile of second-growth forest on the east, largely alder with a bit of Douglas Fir and hemlock; and within 3/4 mile of extensive second-growth forest to the south, largely fir with some alder and hemlock. Apparently the bird was making its way to the sea (within 1 mile from point of capture) when by some mishap it ended up in the garden.

3. 1947, July 15

R. M. Stewart of Masset (QCI) reported to Guiguet (MS 28.vii.47) that a young murrelet, unable to fly, had been picked up by a girl near the road, about 2 miles from salt water, near Masset (E Masset, W Skonum Point), and given to Stewart, who added the bird to his collection (now in PM coll. #10555 female). Stewart wrote (*in. litt.* 14.vi.53) that this locality was about 1/2 mile away from where Feyer cut down his hemlock (cf. nest discovery speculations above).

c) Conclusions

We feel that extreme caution is called for in evaluating these scraps of evidence, viz.:

1. Nest discoveries

Booth's description is at second hand; the only safe conclusion here is that nesting occurs at least 15 miles inland in a generally wooded country.

Warburton's detailed report cannot safely be taken into consideration until identity of the egg is settled beyond question; at present we are inclined to believe that Kittlitz murrelet is involved.

Feyer's record is of an adult and broken egg found within a couple of miles of the sea in wooded country; absolutely no conclusions on nest site can be drawn (?in tree; ?somewhere in path of tree).

2. Discoveries of nest fugitive young

These discoveries result, we believe, when the young birds, flying down from their nest to the sea, meet some mishap and are "grounded" in unfavourable terrain, preventing them from becoming airborne again. Such an interpretation is the only reasonable one for the 1941 Pt. Grey (B. C.) record, and we feel holds true for the others. The only safe conclusions are therefore: 1) the young were making their way over wooded country, not necessarily close to the nest site, 2) nesting apparently goes on as far as 25 miles inland (1940 Oregon record).

Summary

The facts are few: the adults fly in to the nest at dusk, always over wooded country; but the nest itself is not necessarily located in forest. Flights to the nest are especially obvious when the adults carry fish to the young; every observer who has looked into the matter has notes of adults with gleaming fish dangling from the bill drifting about in rafts as night falls, becoming more and more excited as all the birds secure their feed, individuals arcing off to return and land again; but they do not finally flutter off to the nest until it is too dark to trace their flight accurately, mere specks against a grey sea.

The nest is somewhere as close as 1 mile or as far as 25 from the sea. It seems that usually one egg is laid (as Brooks 1926, Willett 1926 stated) but Table 1 suggests that perhaps 2-clutches sometimes occur. (The second developed ovum may, however, be a "surplus," to be resorbed unless the first egg laid is lost; cf. the #4 ovum of Larus fuscus & argentatus, each with 3-clutches, Paludan 1951: 49).

The comparatively uniform stage of development of the youngest known juveniles indicates that they do not leave the nest until the juvenal plumage is virtually complete: there are absolutely no records of downy young. The pigeon guillemot, which sometimes makes its own burrow, but otherwise utilizes all manner of cavities and crevices near the sea, affords an interesting parallel. The young pigeon guillemot when it leaves the nest (egg tooth may or may not be conspicuous, juvenal plumage complete save for traces of down adhering, especially on the lower back) is at precisely the same stage; moreover guillemots at this stage have been caught by hand in brushy areas away from the nest site (Wm. Hughes, pers. comm., Christie Islet, July 21, 1952).

Known incubation periods for Alcids are long (Common murre 32, Brunnich's murre 30-35, Uspensi 1958; Razorbill 34, Atlantic puffin 42, Fisher & Lockley 1954: 282; pigeon guillemot 30) as also is the fledging period for the pigeon guillemot, probably of significance here: av. 35. Thus we can reasonably expect the marbled murrelet to be incubating its egg (both sexes, evidence of brood patches Brooks 1926, and PM coll.) for about 1 month, and feeding its chick at the nest for a further month. We find it difficult to believe that an open site could be used for some two months and avoid detection; the bird must be nesting in some inaccessible site, under cover of some sort. Despite extensive search amongst the nesting burrows of other sea birds, nobody has proven the nesting of the marbled murrelet in such colonies; rather, as suggested by flight of adults at dusk, this bird will be found nesting off by itself.

More can scarcely be said; the important thing is to keep an open mind to all possibilities, and not over-estimate the extent of coverage of any particular habitat. It is significant that the evidence gathered so far has been virtually stumbled upon: of the nest and juvenile discoveries listed above only 1 (Warburton's) was the result of planned search by a naturalist (and this may involve another murrelet).

Season

Judging from Table 1, eggs are laid from the end of April (April 23, 1920) to as late as mid-July (July 13, 1941), with a peak in the latter part of May; Table 2 shows that the first young are to be looked for on the sea toward the end of June, but they may continue to come down as late as early September (see the Oregon records).

Assumed species breeding range (A.O.U. 1957: 251-252)

From Kamchatka and Sakhalin (accidental in Korea) to Honshu and Amami Oshima; and from Unalaska and Kodiak to northern California.

Assumed subspecies breeding range B.m. marmoratum

Southeastern Alaska to northwestern California.

British Columbia

1. indisputable eggs

Eggs removed from the oviduct are listed in Table 1; locality of collection is plotted on Map 10; apparently only that of Sutton was fully formed.

2. nest report

The Feyer record in the Queen Charlotte Islands has been described in detail above; unsubstantiated reports are given in hypotheticals section.

3. records of juveniles

To emphasize that the marbled murrelet breeds throughout our coastline, known specimen records of juveniles not long out of the nest have been plotted on Map 10; selected sight records have been added., All of these are summarized in Table 2. It is important to bear in mind that we have "suspicions" from all areas carefully worked (adults with feed, young on the sea, etc.); this murrelet is definitely an abundant and widespread nester in the Province.

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TABLE 2: Records of Juvenile Marbled Murrelets in British Columbia

All available specimen records and selected sight records

Date	Locality	Particulars	Source
1. Nest fugitives: juveniles captured ashore			
not given	Gil-te-gee see text	Flightless, partially covered by down, primaries in sheaths at bases; taken by hand ashore, see text.	Brooks 1926: Brooks & Swarth 1925
July 23, 1941	Pt. Grey, Vancouver	Completely feathered but egg-tooth apparent, some down adherent, for capture see text.	M-C: 123 UBC #478
July 15, 1947	E Masset, QCI	same descr.; see text	CJG MS PM #10555
2. Young taken on the sea, recently out of nest			
July 22, 1920	Cloak Bay off Cox. I., QCI	quills still in sheaths	Brooks 1926

Date	Locality	Particulars	Source
Aug. 24, 1934	Ragged Islands Pass (Malaspina)	1 male, 1 female, egg-teeth still in place (McCabe)	Dickinson 1953: 155
July 4, 1939	Off Spider Is.	completely feathered but egg-tooth apparent, some down adherent	M-C: 123
June 28, 1947	Peril Bay, W Graham I., QCI	2 females collected, egg-teeth etc., just arrived on sea	CJG UBC # 1482, 1483
July 14, 1957	Brown's Channel, Kyuquot Sound	1 female, egg-tooth conspicuous	CJG MS PM #12943

3. Selected sight records

1947 Queen Charlotte records (CJG MS) West coast Graham Island

June 27	Peril Bay	1st juvenile of the season seen
July 7	Tian Bay	3 juv. seen, believed just out of nest
July 9	Nesto Inlet	1 juv. seen
July 13	Tartu Inlet (Rennell Sound)	1 juv. seen

1948 Queen's Sound records (Guiguet 1953)

June 25	----	1st juvenile of the season seen
July 2	Higgins Pass	5 juv. amongst 150 adults; such concentrations seem to precede general appearance of young on the sea

Miscellaneous south coast notes

July 16, 1927	Off Mitlenatch	1/2 grown young seen, accompanied by parent or parents	M-C: 123
July 15, 1935	Departure Bay	same	M-C: 123
numerous	Sidney-Victoria area	same	CJG MS

9. ANCIENT MURRELET Synthliboramphus antiquum

Nesting habits

So far no one has intensively studied the life history of this bird; the accounts of Heath (1915) covering the 1913 season, and of Willett (1915) that of 1914, both on Forrester Island, SE Alaska, are useful.

This form is a burrow-nester, flights to and from the colony taking place by night, when masses of murrelets come hurtling through the dark to land with a crash in the underbrush, then scurry off to their burrow, a movement starting soon after dusk; later in the night the flight is predominantly away from the colony (Heath & Willett). Despite this nocturnal colony activity, the adults can be found by day lying in rafts offshore from the colonies.

Although grassy slopes may be used, this murrelet seems to prefer locations where the burrows can be sunk in beneath stones, roots, or fallen logs (Heath & Willett). The tunnels are excavated to a length of 1 1/2 to 4 feet (Heath) where the two blotched, elongate eggs are deposited, generally on an accumulation of dried grass (see Bent 1919: 132-141). The parents both incubate, and in 1952 C. J. Guiguet (MS) marked birds in 12 burrows checked daily May 28-June 1 (5 days), in an attempt to work out the incubation rhythm. Unfortunately in all but one case the parents deserted at some stage, but the available data strongly suggest the usual shift to be 48 hours. Incubation period is unknown.

The unique feature of the nesting of this murrelet is that the chicks leave the nest when very young, mere balls of down the size of a man's thumb. They scramble down to the sea under cover of night, in response to the cries of adults (presumably their parents) awaiting them beyond the surf; Guiguet writes (MS) that the slopes of the nesting colonies seem alive with chicks by night during early June; the droves of young birds seem more like baby quail than sea birds. Age at departure is variously estimated as night after hatching (Guiguet MS & Beebe 1960: 169), 1-2 (Heath 1915), 2-3 (Storer in Pough 1957: 120), to about 4 after hatching (Willett 1915). By daybreak the young birds are gone, and are far offshore, for Willett, in seven years' fieldwork noted young at sea by day only once: Bailey and he collected 2 three-quarters grown young together with their two parents (assumed) in the vicinity of Forrester Island, July 21, 1920 (Bailey 1927: 13; Willett 1920).

Fig. 42.
June, 1952. G.C.Carl. Langara Island. Ancient murrelet: incubating adult being removed from burrow, on forested slope. The black bib and white plumes over the eye and frost at the shoulders characterize the breeding bird.

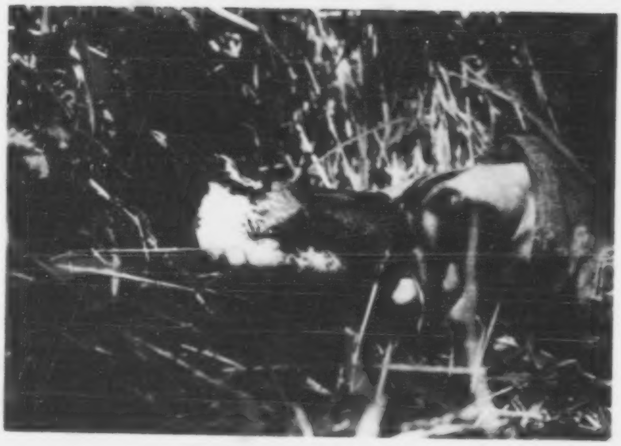


Fig. 43.
c. June 5, 1960. J. B. Foster. Langara. Ancient murrelet: adult and clutch of 2 eggs. The elongate eggs are huge for body size of adult, no larger than a big robin.

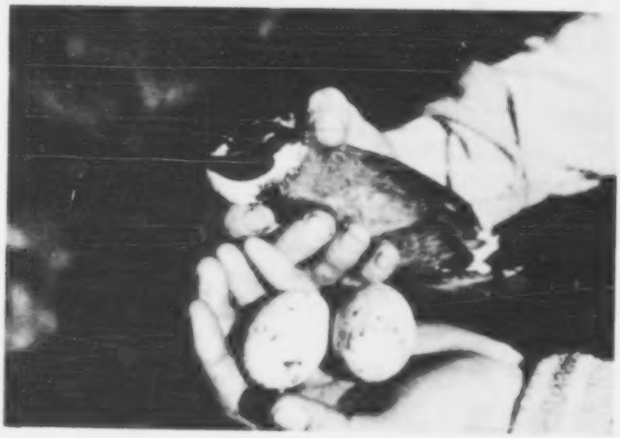
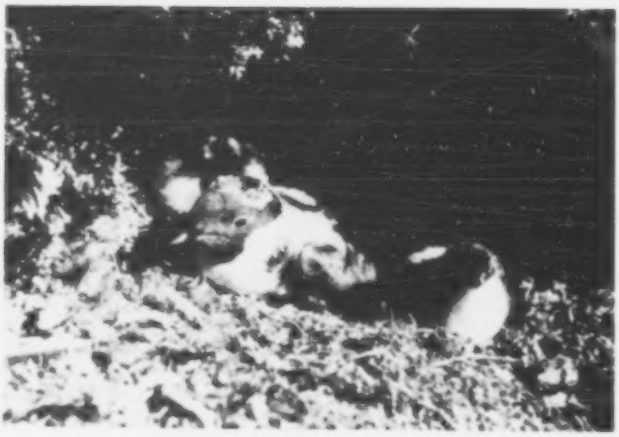


Fig. 44.
c. June 5, 1960. J. B. Foster. Langara. Ancient murrelet: adult with 2 newly hatched young, posed near burrow entrance. Perhaps the chicks will scramble down to sea in the coming night.



Guiguet has only a single record of small young seen on the littoral waters by day: 2 downy young accompanied by 1 adult, SW Moresby Island near N shore Kunghit, Queen Charlotte Islands, June 1, 1959 (MS). However, he has observed them on pelagic waters 18-20 miles west of the Goose Islands. On May 13, 1948, he collected two small downies from 8 family groups observed, each group made up of two downies accompanied by two adults. Young and adults move back into littoral waters as the young attain larger size and juvenal plumage. (Guiguet 1953)

Season in British Columbia

Most eggs appear to be laid from the end of April through May (Bent 1919 gives April 20 for eggs in QCI; 2 sets of 2 May 1, 1936, Langara Island, q.v.; last definitely fresh eggs May 30, 1952, Henslung Cove area q.v.). The best dates on hatching are those of CJG for Henslung Cove area, Langara: first young come down toward the close of May (May 26, 1947, first record; May 27, 1952 a few), but the heaviest exodus occurs in the first week or so of June; latest definite date June 14, 1946, and July 5, 1930 (Lucy Island, q.v.). This rough sketch agrees fairly well with Heath (1915; 1913 season Forrester, SE Alaska: first young May 29, abundant by June 2, seen as late as July 1) and with Willett (1915; 1914 season same island: young from before May 23 to July 2, peak June 1-10).

Species breeding range (A.O.U. 1957: 253; no subspecies)

Kamchatka and Commander Islands south to Sakhalin, the Kuriles, Korea, and the Dagelet Islands; east through the Aleutians (scattered) to the Shumagins and Kodiak Island (but probably not to the north side of the Alaska Peninsula, Murie 1959: 190-191), and through southeastern Alaska (St. Lazaria, Forrester, and Howkan G&L: 493) south to the Queen Charlottes; a sole record for Washington (cf. below).

British Columbia

This species reaches its usual southern limit in our Province. Hoffmann (1924) recorded collecting a single female and her two eggs from a burrow on Carroll Island, in the Olympiades, Washington, on May 9, 1924. Since that time nothing further has been discovered about nesting in that state (Jewett et al. 1953, and Dr. F. Richardson *in litt.* 26.iv.1960), so it is best to regard its breeding there "casual" as the A.O.U. (1957) checklist does.

LANGARA ISLAND, QCI (old name North Island) off NW tip Graham Island

> Immense numbers nesting here; the east and south shores support an almost continuous colony, where murrelets nest on all grassy headlands and timbered slopes with sufficient gradient (a critical limitation). The sites numbered below represent localities especially studied; early records can not always be located, hence "general notes."

General Notes

1910, June 10. 2 eggs collected by E. M. Anderson (PM).

1915, ca. April 20-May 1. nesting by the thousands (Green 1916).

(1920) listed by Brooks & Swarth (1925)

1927, May 5. stated to breed abundantly by Darcus (1930); set of 2 eggs collected by him this date (ROM).

1936, May 1. 2 sets of 2 eggs collected by S. J. Darcus; each was accompanied by adult in burrow (WSM coll.).

1. Langara Island Light, Langara Point (Cape Santa Marguerita), NW tip of island, 54°15' N, 133°04' W.

1926, late June. Young (1927) noted burrows of this species here.

1946, July 2. Remains of birds and egg shells found above numerous burrows (CJG MS).

1947, May 24. 1 adult and 2 eggs found in burrow at base of cliff by lightkeeper's dog (CJG MS).

2. McPherson Point, west to RCAF Radar Station, NE shore of island, 54°15' N, 132°59' W.

1947, May 22. Eggs found in burrows excavated; much murrelet sign here (CJG MS).

3. Area behind Dadens settlement, E Beal Cove, across from Lucy Island, SE corner of island, 54°11' N, 132°59' W.

1926, June 17. Young (1927) noted a large colony here, and took eggs June 16-17; 1 taken by him here at date given (ROM).

4. Henslung Cove area (both E&W from here); W Dadens, 54°12' N, 133°01' W.

1946, May 20. 4 eggs and 5 adults purchased from Indian digging burrows (CJG MS).

May 24/25. Night-long observations with R. M. Stewart, 4 eggs and 1 adult male collected (CJG MS).

June 6. Several downies collected on way to sea (CJG MS).

June 14. 1 adult with 2 spoiled eggs; and 3 downy young taken in mouse traps. All burrows excavated either empty or with egg shells, but no young (CJG MS).

1947, May 14. 3 eggs collected, and 3 adults: 2 females, 1 male (CJG MS).

May 16. 14 sets of eggs collected, and 1 ad. male on eggs CJG MS); 2 sets of 2 are now in WSM coll., 1 fresh, 1 well advanced.

May 25. 1 set of 2 eggs (advanced) with female in burrow, WSM coll.

May 26. First young noted coming down to sea at night.

June 6. The big hatch is on, thousands of downies, escorted by parents, go down to sea every night (CJG MS).

1952, May 23. 3 of 6 adults shot held eggs (CJG MS).

May 27. A few downies coming down about 12:30 a.m.; 2 downies with adults captured (CJG MS).

May 28. Burrows excavated west of the cove--eggs, fresh to fully incubated (CJG MS).

May 30. 1 of 5 adults collected held fully formed egg. Night of 30/31 observed incoming flight of adults and exodus of young 1200-0230.

May 31-June 1. Another night's observation; same (CJG MS).

1952, June 6-8. Young coming down in early morning hours (CJG MS).

1960, June 5. 3 nests excavated, 2 with 2 eggs, 1 with 2 young; estimate more than 2000 pair in Henslung area (J. B. Foster, BCNRS).

COX ISLAND, QCI, Cloak Bay, SW shore Langara Island. 54°12' N, 133°01' W.

1927, June 1. Stated to be breeding (Darcus 1927); 2 eggs collected by him this date (ROM).

1946, June 16. Nesting; a few adults seen on the crest by night, coming in to their burrows (CJG MS).

1947, May 13. 4 pair of eggs collected (CJG MS); 1 set of 2 (fresh) now in WSM coll.

1952, May 13. Base and top perforated by burrows this species; those examined held adult and 2 fresh eggs (CJG MS).

LUCY ISLAND, QCI, Solide Passage, S Dadens on Langara Island. 54°11' N, 132°59' W.

1926, June. Young (1927) found them nesting; apparently the eggs he collected were from Dadens q.v.

1930, July 5. Cumming (1930) collected adults, eggs, and downy young.

1946, June 28. Island perforated with burrows of this species (CJG MS).

1960, June 4. Colony of at least 100 pair on NW corner of island; burrows held egg shells or young. J. B. Foster (BCNRS).

FREDERICK ISLAND, QCI, off NW shore Graham Island, 53°56' N, 133°01' W.

1946, June 22. Season over; burrows found with egg shell fragments; no downies heard or seen (CJG MS).

HIPPA ISLAND, QCI, outside Nesto Inlet, N Rennell Sound, W coast Graham Island, 132°58' N, 53°32' W.

1927. Reported to breed by natives (Darcus 1930).

1947, July 10. One old egg shell found; burrows noted (CJG MS).

LIHOU ISLAND, QCI, Englefield Bay, off NW tip Hibben Island, NW coast Moresby Island. 53°00' N, 123°25' W.

1959, June 15. Egg shells and burrows found (CJG MS).

1960, August 24. Burrows numerous; identification by egg shells and adult remains (J. B. Foster, BCNRS).

HELGESEN ISLAND, QCI, Boomchain Bay, off Englefield Bay, NW coast Moresby Island, 53°02' N, 132°26' W.

1959, June 13. Egg shells found; hatch is over (CJG MS).

SAUNDER ISLAND, QCI, Englefield Bay, Kaisun Harbour, just W Helgesen Island, NW coast Moresby Island. 53°02' N, 132°28' W.

1959, June 14. Egg shells found; counted 1500-2000 birds on the water between Lihou-Helgesen-Saunder (CJG MS).

REEF ISLAND, QCI, Hecate Strait, SE Louise Island. 52°52' N, 131°31' W.

1960, July 5. Egg shells, burrows, and remains of adults noted on steep forested hillside (J. B. Foster, BCNRS).

AGGLOMERATE ISLAND, QCI, E of SE tip Lyell Island, 52°38' N, 131°25' W.

1960, July 27. Nesting inferred from burrows, egg shells and adult remains in coast forest (J. B. Foster, BCNRS).

GEORGE ISLAND, QCI, Skincuttle Inlet, near SE end Moresby Island, 52°21' N, 131°12' W, and EAST COPPER ISLAND, QCI, same descr., 52°22' N, 131°11' W.

1960, July 31. Nesting inferred from burrows, egg shells and adult remains in coast forest (J. B. Foster, BCNRS).

BOULDER ISLAND, QCI, entrance to Houston Inlet S Skincuttle Inlet, Moresby Island, 52°18' N, 131°18' W, and SEA PIGEON ISLAND, same descr., 52°17' N, 131°17' W.

1960, August 4. Nesting inferred from egg shells, burrows, and wings of adults; whole islands appear utilized. (J. B. Foster, BCNRS).

10. CASSIN AUKLET Ptychoramphus aleutica

Nesting habits

This is another nocturnal burrow-nester, again not at all well known; Littlejohn (1894, in G&L: 497-498), Dawson (in Dawson & Bowles 1909), Heath (1915), and Willett (1915) have left accounts.

The burrows (3 1/2 - 4" diameter, from a few inches to a foot below the surface, and about 3-7 feet long CJG MS) are generally indistinguishable from those of the ancient murrelet (G&L: 495; Willett) but Cumming (1930) and Guiguet (MS) have found a dung-covered platform at the entrance characteristic for the auklet's burrow. Mixed colonies often occur, but Guiguet (MS) noted a preference for high grassy slopes near the crest of cliffs in this species. Of course, such problems of recognition will be met only in the Queen Charlottes in our Province, the ancient murrelet not nesting south of this group.

Only a single, unmarked egg is laid, usually on an accumulation of dried vegetable rubbish. Both parents incubate, exchanges taking place at night, but length of shift and incubation period remain unknown. The chick, in sharp distinction to the ancient murrelet, but like other burrow-nesting alcids, is fed in the nest until fully fledged (Bent 1919: 110-116); this takes "fully three weeks" (Heath).

Season

The observations of Guiguet in the Queen Charlottes, supplemented by egg records of Darcus, allow the following sketch for that area: egg-laying from early April (at least) onwards (April 4 & 15, 1927; April 23, 1948; April 24, 1927, Langara Island q.v.); late dates (eg. July 20, 1909 Triangle) probably are addled eggs. Young hatch from early May on (May 13, 1947 newly hatched to 1/2 grown, Cox), peak in hatching latter half of month; juveniles ready to leave burrow by early July (July 6-7, 1946-47, Cox & Tian). Bailey (1927) found young ready to fly on Forrester Island July 9, 1920; Heath and Willett do not help here.

Fig. 45.
Cox Island, QCI. June 7, 1952. G. C. Carl. Cassin auklet: adult removed from burrow. Smaller than murrelet, on water looks all dark (only abdomen is white), with small eyebrow patch and pale spot on lower mandible when seen close up.

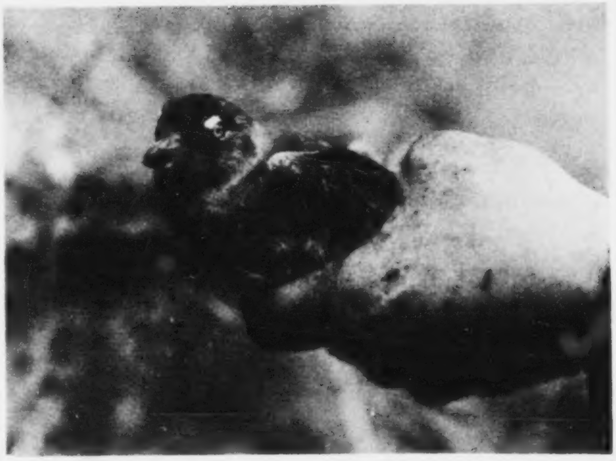
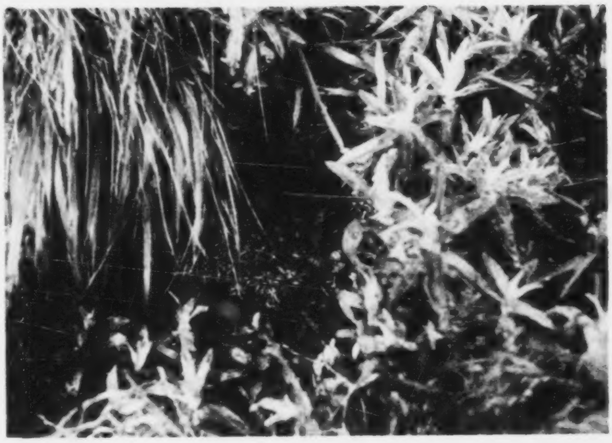


Fig. 46.
Triangle Island. June 30, 1949. G. C. Carl. Cassin auklet: burrow entrance, c. 3 1/2 - 4 inches diam.; burrows range from 3-7 feet in length.



Species breeding range (A.O.U. 1957: 253-254)

Pacific coast of North America from Sanak Island (formerly, see below) Alaska, to central Baja California.

Subspecies breeding range (P.a. aleutica)

Formerly from Sanak Island (W tip Alaska Peninsula), now uncommon west of Kodiak, where it has bred (Murie 1959; G&L: 191-192); the only Alaskan colony where present-day nesting is positive is Forrester Island (G&L: 496); south along the coast to San Geronimo and San Martin Islands, Baja California, and Guadalupe Island.

British Columbia sites

LANGARA ISLAND, QCI (old name North Island), off NW tip Graham Island.

Again nesting over much of Langara's shoreline and as well on Cox and Lucy Islands adjoining. Vague records are given first; localities of specific study follow.

General Records

1927, April 4 & 24; June 20. Darcus (1930) reported them to nest abundantly; 1 egg taken by him on each of the dates listed (ROM); he also reported well-incubated eggs April 15.

1930, mid-June--end July. Cumming (1930) collected adults and downy young from their burrows sometime in this period.

1936, April 26. Darcus collected 1 egg, adult in the burrow (WSM coll.).

1. Langara Island Light, Langara Point (Cape Santa Marguerita), NW tip of island, 54°15' N, 133°04' W.

1926, June. Young (1930) noted burrows here.

1946, July 2. Burrows and egg shells noted; season over (CJG MS).

1947, May 22. Large colony; 1 burrow excavated, 1 chick and 1 adult collected (CJG MS).

May 24. Several burrows excavated, 1 with egg, all others with downy young, each brooded by 1 parent (CJG MS).

May 25. 14 burrows checked: 2 with single egg and 1 incubating adult each; 12 with 1 downy young and 1 brooding adult each (CJG MS).

1948, April 23. 3 eggs collected, each from burrow with 1 adult (WSM coll.).

2. McPherson Point, west to RCAF Radar Station, NE shore of island, 54°15' N, 132°59' W.

1947, May 22. Burrows excavated; young downies, but no eggs found (CJG MS).

3. Cohoe Point, N side, ca. 300 yards from tip E shore of island, 54°14' N, 132°58' W.

1947, May 29. Burrows noted but not excavated (CJG MS).

4. Henslung Cove area, SW shore, W Dadens, 54°12' N, 133°01' W.

1947, May 17. 2 downy young, 1 adult excavated--the first taken nesting here (CJG MS).

COX ISLAND, QCI, Cloak Bay, SW shore Langara Island, 54°12' N, 133°01' W.

1927. Nesting according to Darcus (1927).

1946, May 27. With R. M. Stewart excavated 7 occupied burrows; 3 held downy young, 2 of which were accompanied by an adult; 4 held a single egg, each with an adult; all of these were collected (CJG MS). One of these eggs is now in WSM coll.

June 6. 2 burrows held a single downy young each (CJG MS).

June 16/17. After all-night observation, when but few auklets were seen, digging yielded 1 adult male alone in 1 burrow, and 1 downy young in another; both collected (CJG MS).

July 6. 1 young, ready to leave burrow, excavated (CJG MS).

July 7. Another young, ready to leave burrow, excavated (CJG MS).

1947, May 13. 6 burrows excavated: 2 held 1 egg and 1 adult each; 4 held chicks ranging from newly hatched to 1/2 adult size; apparently the smallest was being brooded by adult; 3 adults were collected (CJG MS).

May 31. 6 burrows excavated: 5 held downy young, 1 held a single egg (CJG MS).

1952, May 13. Numerous burrows at cliff crest, 2 excavated, both held egg ready to hatch (CJG MS).

May 15. Adult taken with newly hatched young (CJG MS).

June 7. 4 burrows excavated held downy young (robin-sized), 1 a recently hatched downy.

FREDERICK ISLAND, QCI, off NW shore Graham Island, 53°56' N, 133°10' W.

1946, June 22. Season almost over; 1 adult male with 1 egg collected after much excavation on west side; probably a numerous breeder here (CJG MS).

TIAN ISLETS, QCI, E Tian Head, forming west boundary Tian Bay, central W coast Graham Island. N islet: 53°46' N, 133°05' W; S islet: 53°45' N, 133°05' W.

1947, July 7. Nests in numbers: several burrows excavated held 1 large chick each (CJG MS).

TREE ISLETS, Queen Charlotte Strait, just NE Pine Island, 50°59' N, 127°43' W.

1929, June 13. Several fledglings excavated, hatched about 3 weeks and about ready to take to water (Young 1930).

PINE ISLAND, Queen Charlotte Strait, 50°59' N, 127° 43' W.

1915-1933. Many nesting according to P. C. Pike, lightkeeper in that period (Q).

1929, June 1-18. 3 eggs found in this period sometime (Young 1930).

1932, April 28. Young collected 1 egg, now in WSM coll.

TRIANGLE ISLAND, outermost of the Scott Islands lying west of Cape Scott, the N tip of Vancouver Island, 50°52' N, 129°05' W.

1909, July 20. 1 egg collected by W. Burton (PM).

1910, June 1. 1 egg collected by W. Burton (PM).

1949, June 24-July 1. The Museum party collected 3 eggs (2 fully set, 1 deserted) but most burrows examined held young almost capable of flight; they report that this is the largest known colony in the Province (Carl et al. 1951).

SARTINE ISLAND, next in line of Scott Island, 50°49' N, 128°54' W.

1950, June 21-22. The Museum party reported auklets nesting in numbers here (Carl et al. 1951); large downies to almost fully fledged young found (CJG MS).

BERESFORD ISLAND, still farther east in Scott Islands, lying to W of Lanz; 50°47' N, 128°46' W.

1950, June 20-21-22. The Museum party collected large fledglings in near juvenile plumage from the burrows excavated (Carl et al. 1951).

SOLANDER ISLAND, off Cape Cook, Brooks Peninsula, NW coast Vancouver Island. 50°07' N, 127°56' W.

1954, July 1. Guiguet (1955) reported auklets to be nesting here in numbers. Large downies to almost fully fledged young in the 6-8 burrows excavated in the brief exploration here (CJG MS).

11. RHINOCEROS AUKLET Cerorhinca monocerata

Nesting habits

Young (1930) has described the Pine Island colony, and Cowan and Guiguet (MSS 15/16 Aug. 1946, referred to as C&G) that at Moore Head. The usual sources have also something to add, but results from Dr. Richardson's current studies in Washington will be most welcome.

This auklet is largely nocturnal at the nesting grounds, but adults can be seen in the area at any time of day. The bird is most often seen before 0900 and after 1930 however (1959/60 Mandarte MS); the best time to watch for them is about 2000 (sunset) when rafts begin to form in the gathering dusk preparatory to the return flight to the colony.

The British Columbia colonies are all in wooded situations, where the auklet tunnels out an irregular burrow twisting amongst the tree roots and rocks. These burrows are recognizable by their large caliber (5" Dawson in Dawson & Bowles 1909: 6" C&G), and run in to great length (C&G found an average of 6', none being less than 4'; Young recorded an average of 10-15', with extremes at 6 and 25; Dawson gave 5-8'; Heath [for Forrester] at least 8', extreme 20'; and Willett [same island] 7-9'.)

Fig. 47.
May 30, 1952. G. C. Carl. Langara Island. Rhinoceros auklet: incubating adult removed from burrow. Conspicuous facial plumes and white horn atop the yellow bill are shed in winter. On water pale abdomen concealed, bird appears all dark; usually head retracted: wood block effect.

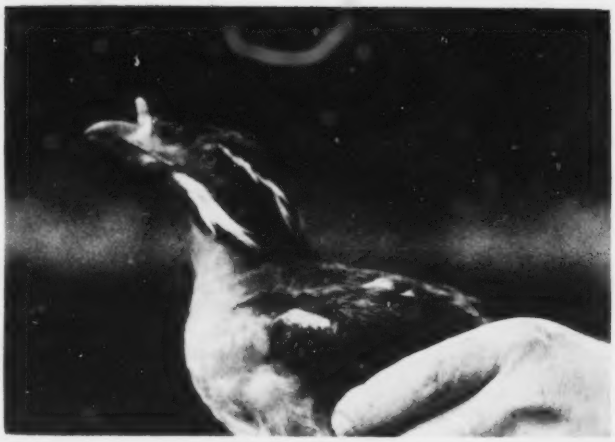


Fig. 48.
August 16, 1946. I. McT. Cowan. Kunghit Island. Rhinoceros auklet colony site: burrows on headlands, beneath salal, alder, etc.; e.g. centre foreground.

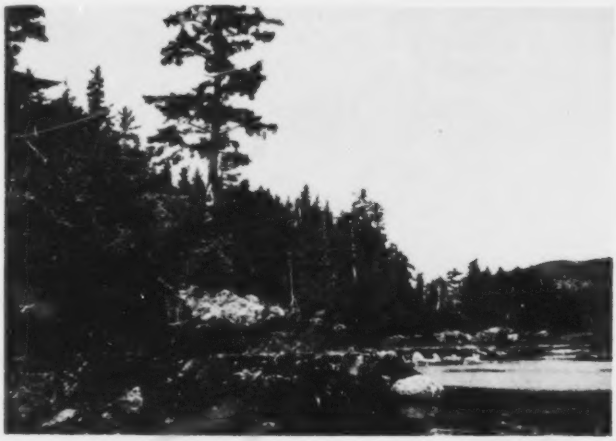
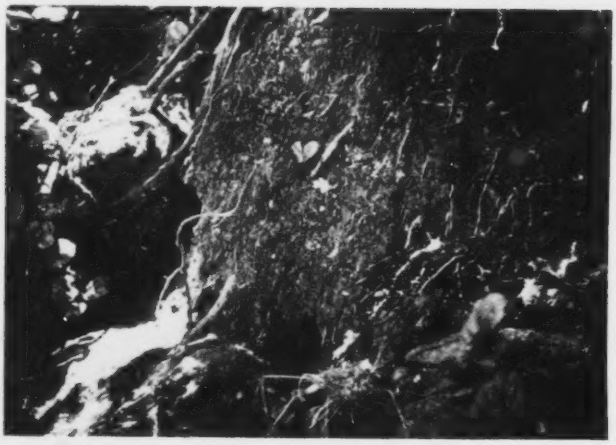


Fig. 49.
August 16, 1946. I. McT. Cowan. Kunghit Island. Rhinoceros auklet: burrows and platforms. Burrows here were c. 6 inches in diameter, and averaged 6 feet in length.



Blind side-alleys are common (C&G, Heath) but eventually the terminal chamber is reached where the single white egg (when fresh with obscure tracery, usually obliterated by stains from soil) is deposited on a heap of oddments dragged in from the entrance area: salal, grasses, spruce twigs, etc., depending on situation. Incubation period is unknown, but both parents take part, and later both feed the chick in the burrow until fully fledged (Heath). Night activity at the colony occurs in two spurts, one following dusk, the other before dawn (Heath & Willett).

An all-night watch late in the season (Kunghit, C&G), when young were being fed in the burrow, revealed the beginning of an incoming wave of adults, most of them with fish in the bill, at 2115 when the observers took up station; this movement was followed by a lull about 1200-0200, succeeded by a predominantly outward flight from then until dawn (0300). Apparently each adult brought one load of feed per night. Feeding distances are said to be great; Heath calculated 120-mile round trips; adults flying south at dusk with feed in the bill are often noted in the Oak Bay area E Victoria (CJG MS; D. Stirling July 17, 1955), where the closest known colony is Protection Island, Washington (F. Richardson, *in litt*. 26.iv.60) 26 miles south.

Season

The rather meagre information from our colonies, all on the north coast, can be compared with dates from Forrester Island, SE Alaska (Heath and Willett) and Protection Island, Washington (data in BCNRS submitted by Dr. F. Richardson).

Egg-laying on Protection commences in late April (April 21, 1957 1st egg) and extends through May (May 3, 1958: 1; May 20, 1956 many, from fresh to well incubated); earliest date from B. C. is May 21 (1932, Langara); latest early June (1-7, 1929, Pine). For Forrester Heath gave June 1-15 (1913), Willett 4th week May-far into June (1914) as the egg-laying period.

Young hatch from mid-June on (June 16, 1956 small young Protection; June 15 yng. Helgesen, QCI; Heath noted first young Forrester June 27, 1913). In the Queen Charlottes the young appear on the water mid-August on (earliest record August 16, 1947, 1 taken Wiah Pt. CJG MS); Heath found the burrows on Forrester empty by Aug. 6, 1913 (but cf. Moore Head, QCI); Protection Island was deserted by Sept. 8, 1956.

Species breeding range (A.O.U. 1957: 255; no subspecies)

From the Maritime Provinces, southern Sakhalin, and the southern Kuriles south to Korea and northern Honshu; and from southeastern Alaska (St. Lazaria & Forrester definitely known G&L: 512-513) to northwestern Washington (Protection & Destruction definitely known, F. Richardson in litt. April 26, 1960; formerly on Whidbey, Smith, etc.); formerly to Farallon Islands, California.

British Columbia

LANGARA ISLAND, QCI, (old name North Island) off NW tip Graham Island.

1932, May 21. 1 egg collected by C. J. Young (WSM coll.); no further detail.

1936, August 12. Allan Brooks' notes read (MS IMcTC) "When we got near Langara I saw adults flying with fish in their bills towards the land east of Lucy Island."

1946, July 3. Adults heard growling in their burrows at night, from boardwalk east of lighthouse, Langara Point (Cape Santa Marguerita, NW tip of island, 54°15' N, 133°04' W). Terrain made investigation by single observer impossible (CJG MS).

1947, May 24. On a salal-covered headland on the west shore, 1/2 way to Cloak Island (Lacy Island) from Langara Point, an abandoned colony was found, the burrows being unmistakable. Search revealed no clues to recent nesting (CJG MS).

The only colony on the island definitely known to be in existence at present was found by R. M. Stewart in 1947, and revisited by G. C. Carl and Guiguet in 1952.

Headland just west Henslung Cove, E Iphigenia Point, S shore Langara, 54°11' N, 133°00' W.

1947, July 25. This date R. M. Stewart took a downy young (now PM10558) from a burrow here, in a large pigeon guillemot colony; only the one burrow was excavated.

1952, May 30. The site was visited by Carl & CJG; 6 burrows here, one excavated and an adult taken on the single egg (which held a partially formed embryo); the adult was photographed (see Fig. 47) and later released. Dispersed nesting of this sort along the Langara shoreline may account for the large numbers of rhinos regularly seen here in the breeding season.

HELGESEN ISLAND, QCI, Boomchain Bay, Englefield Bay region on NW coast Moresby Island, 53°02' N, 132°26' W.

1959, June 13. Search of an unmistakable group of burrows yielded one egg shell (CJG).

June 15. 1 young excavated (CJG MS).

LIHOU ISLAND, QCI, off NW tip Hibben Island, Englefield Bay, NW coast Moresby Island, 53°00' N, 132°25' W.

1959, June 15. Egg shells and adult remains found around the characteristic burrows (CJG MS).

MOORE HEAD, N end Kunghit Island, QCI; E Rose Harbour, Houston Stewart Channel, 52°09' N, 131°03' W.

1947, August 15/16. As related above, Cowan and Guiguet (MSS) spent the night observing the activity at this colony; on the 16th 5 burrows were excavated: 4 contained downy young or fledgling chicks; colony estimated at 100-150 pair, burrows found on three small headlands.

LUCY ISLAND, Chatham Sound, 12 miles west of Prince Rupert, 54°18' N, 130°36' W.

1907, June. Rev. J. H. Keen collected 1 egg here, now in the National Museum collections, Ottawa (No. 874, W. Earl Godfrey, in litt. Oct. 27, 1960). This record was erroneously cited for a Lucy Island west of Metlakatla, Alaska, in G&L: 512, (see Drent in press).

1959. Present lightkeeper F. Glinn reported rhinos nesting (Q via G. C. Odlum).

North and Southeast GANDERS, W Moore Islands, W Aristazabal Island, Hecate Strait, approx. 52°39' N, 129°26' W.

1936, June 2 & 6. Reported to breed here by Indian fishermen who regularly went egging in this group (McCabe MS).

PINE ISLAND, Queen Charlotte Strait, 50°59' N, 127°43' W.

1909. First discovered nesting here by Green and Burton (Young 1930).

1910. 1 egg collected by Burton (PM).

1915-1933. P. C. Pike, with whom Young stayed on his 1929 visit, remembers rhinos nesting in large numbers throughout the period he was lightkeeper there (Q).

1922, May. V. Hart took 1 egg by excavating a 25' burrow (Young 1930).

1929, June 1-18. Young (1930) was on the island this period, and reports finding fresh eggs up to the 7th; no other colonies were found in the vicinity.

1957, F. H. Barclay, lightkeeper (*in litt*. iv. 1958) reported that he had found a burrow of this species; identification sounded uncertain however.

12. TUFTED PUFFIN Lunda cirrhata

Nesting habits

This, the last on our list of British Columbia sea birds, has again never received detailed life-history study; it is another burrow-nester, but in sharp distinction to many of the other auks, carries out its activities by day. The puffin generally nests in dense colonies on high grassy slopes, where the soil is riddled with burrows, hacked out by a pick-axe action of the massive bill (judging from the Atlantic Puffin, Lockley 1953). This is the typical situation, but sometimes natural crevices and cavities in a rockface may be used, as Bent (1919: 82-88) and Dawson (in Dawson & Bowles 1909) noted. Such rock chambers are used on Mandarte Island, B. C., where no suitable burrowing terrain exists. Dawson has recorded still another variant, where the eggs were laid on the soil surface in the cover of a salal thicket.

Mating takes place on the water (van Tets MS), and the single white egg (with obscure tracery) is laid at the end of the 3-4 foot (Dawson) burrow, almost always on an accumulation of grasses, salal leaves, etc. The rock crevice nests on Mandarte had such grass beds, and here the adults must have made special trips to other parts of the island to gather the material. Both parents incubate (shifts and period unknown). The chick is fed in the burrow until fully fledged, and ready to take to sea and an independent life (Dawson). Characteristic for puffins is the feeding method: a number of fish are brought at once, and the adults fly to the burrow with a whole flashing beakful of feed, held crosswise.

Season in British Columbia

But few dates available; apparently most eggs are laid in June (earliest June 1, 1929, Storm) and chicks can be expected in the latter half of July; the young leave the burrow by the end of August (see Mandarte records). On Forrester Island Heath (1913 season) reported laying 3rd week in June, with the first young in mid-July; Willett (1914 season) gave laying as starting in the 2nd week in June.

Species breeding range (A.O.U. 1957: 257) (No subspecies)

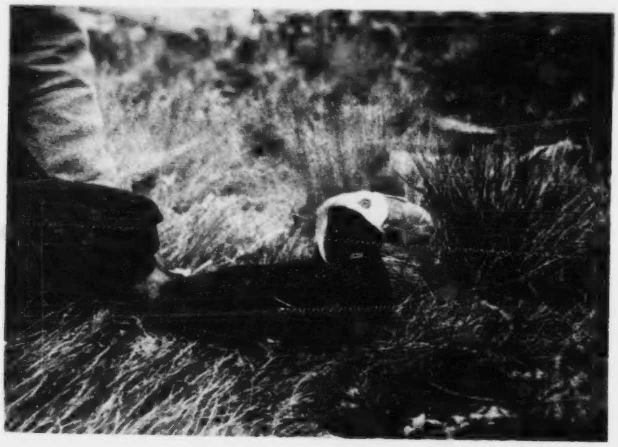
Kolyuchin Islands (Koljutschin) eastern Siberia, East Cape, Diomedes, south to Kamchatka, Commander Island, Kuriles, Sea of Okhotsk, Sakhalin, Maritime Province, and Hokkaido; on the American side from Cape Lisburne south all along the Alaska coast (G&L: 518-519): Kotzebue Sound (Chamisso), Norton Sound (Cape Denbigh, Besboro & Egg Islands), King, Sledge, St. Lawrence, St. Mathew, Pribilofs, throughout Aleutians (where it is the most abundant bird, Murie 1959: 204-205), along S side Alaska Peninsula (Semidis, Kodiak), Kenai area, and southeastern Alaska (Glacier Bay, St. Lazaria, and Forrester) south on coastal islets to Santa Barbara Islands, southern California.

British Columbia

LANGARA ISLAND, QCI (old name North Island), off NW tip Graham Island. Cliffside area west of Iphigenia Point (W Henslung Cove), SW coast. 54°12' N, 133°01' W.

1920, July 22. Allan Brooks (MS per IMcTC) noted "several colonies in SW corner" (of Langara) and stated that most birds had eggs still, but that young were commencing to hatch.

Fig. 50.
June 29, 1949. G. C. Carl. Triangle Island. Tufted puffin: adult removed from burrow. Note heavy parrot-like bill (operator wears gloves!); distinguished from other puffins by white face and long yellow plumes on all-black body.



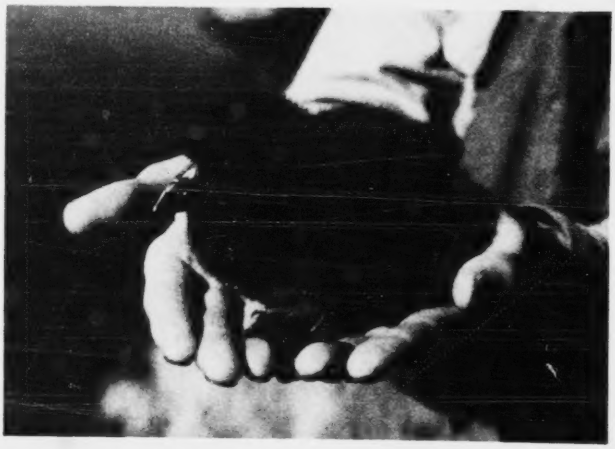
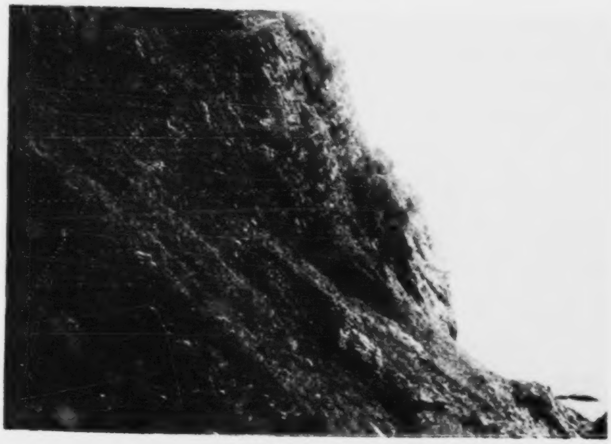


Fig. 51.
July 27, 1960. J. B. Foster. Tuft Islets. Tufted puffin: downy young. Note heavy bill, egg-tooth visible.

Fig. 52.
June 27, 1949. G. C. Carl. Triangle Island. Tufted puffin: nesting habitat on B. C.'s largest colony. Burrows amongst grass tussocks from 200 feet up to crest (max. elev. 690); steep slopes and grassy cliff crests favoured.



Details are not given; this no doubt was the basis for citation in Brooks & Swarth 1925.

1927, June 8, 11, & 20. Darcus (1930) reported one large colony for Langara, which can be located from the photograph in his 1927 paper. 2 eggs were taken on the 8th, 1 on the 11th, and 1 on the 20th (ROM).

1947, May 13. ca. 150 birds on grassy clifftop area this date; the burrows, largely inaccessible, were obviously being used for nesting however. This was the only inhabited colony on the island at that time (1946/1947, CJG MS).

1952, May 13. 14 adults observed circling the same colony area--1 landed in burrow entrance (CJG MS).

May 23 and June 7. 50-60 birds on sea off colony area (CJG MS).

1960, June 8. Burrows noted; adults hanging about the colony estimated at 15 pair (J. B. Foster, BCNRS).

COX ISLAND, QCI, Cloak Bay, SW shore Langara Island, 54°12' N, 133°01' W.

1946, July 6. 2 adults observed leaving their burrow; excavated, but still empty. ca. 40 resting on sea in this area (CJG MS).

July 7. Lowered by rope, 10 burrows excavated, still no luck in finding eggs (CJG MS).

1947, August 18. Had been seen frequenting the clifftops earlier (July 4), but this date adult seen to enter burrow with fish, and when excavated 1 downy young collected (CJG MS).

1952, May 13. 6-8 birds on sea below colony (west Cox) (CJG MS).

LIHOU ISLAND, QCI, Englefield Bay, off NW tip Hibben Island, NW coast Moresby Island. 53°00' N, 123°25' W.

1959, June 15. 2 adults hanging about; suspect nesting; time did not permit search (CJG MS).

HELGESEN ISLAND, QCI, Boomchain Bay off Englefield Bay, same descr., 53°02' N, 132°26' W.

1959, June 13 & 15. 2 adults hanging about; suspect nesting; time did not permit search (CJG MS).

TUFT ISLETS, QCI, E Fuller Point, Lyell Island, 52°42' N, 131°25' W.

1960, July 27. Estimated 30 pair circling burrow-riddled steep grassy cliff; one accessible burrow excavated and downy young found (see Fig. 51). J. B. Foster, BCNRS.

Islet in Houston Stewart Channel (N Kunghit Island, QCI).

1900. Osgood (1901) reported "a moderate-sized breeding colony was found on an islet in Houston Stewart Channel." He was in this area July 3 on "for a few days" landing at Skidegate July 9; an adult was taken July 5, possibly date of visit to the colony.

KUNGHIT ISLAND, QCI, tiny unnamed islet off Lyman Point, E side Kunghit, and adjacent rockface, 52°06' N, 130°56' W.

1960, August 15. Estimated 25 pair circling burrow-riddled steep grassy cliff here; colony inaccessible. J. B. Foster, BCNRS.

KEROUARD ISLAND, QCI, off Cape Saint James, S end Kunghit Island. 51°55' N, 131°00' W.

1958, June 21. Numerous burrows, 5 inspected: all had a single egg, in two cases accompanied by incubating parent (both collected; females). S. Shearman, BCNRS.

N GANDERS, unnamed islet W of channel between main Moore Islands, and W of anchorage; Hecate Strait W Aristazabal Island. 52°40' N, 129°26' W.

1936, June 2. 1 or 2 seen to come out of burrows in earth at top of rock under edge of sparse crown of timber; 4 adults collected (T. T. McCabe MS).

STORM ISLANDS, Queen Charlotte Strait near N entrance, N Pine Island, 51°02' N, 127°43' W.

1929, June 1. Young (1930) secured two fresh eggs from the Indians on Storm (now in ROM) and a few days later another one.

PINE ISLAND, Queen Charlotte Strait, 50°59' N, 127°43' W.

1930, July 16. 1 egg taken from burrow under tree-roots by C. J. Young (WSM coll.). A possibility of confusion of records exists here, as Young (1930) states he obtained no puffins on Pine Island in 1929.

TRIANGLE ISLAND, outermost of the Scott Islands lying west of Cape Scott, the N tip of Vancouver Island. 50°52' N, 129°05' W.

1949, June 24-July 3. The Museum party found 1 well-incubated egg tended by 1 adult in all burrows examined (no downy young yet) and reported this to be the largest known colony in the Province (Carl et al. 1951). One of the eggs collected is now in WSM coll. (June 28), another in ALM coll. (June 29).

1958, July 9. S. Shearman (BCNRS) inspected 2 occupied burrows here (1 young, 1 egg).

SARTINE ISLAND, next in line of Scott Islands, 50°29' N, 128°54' W.

1950, June 21-22. The Museum party reported nesting here (Carl et al. 1951); available time was short: burrows & adults plentiful, but burrows excavated were unoccupied (CJG MS).

BERESFORD ISLAND, still farther east in Scott Islands, lying W of Lanz; 50°47' N, 128°46' W.

1950, June 20-21-22. Several adults incubating eggs collected from their burrows by the Museum party (Carl et al. 1951); 3 eggs taken June 21 in WSM coll.

SOLANDER ISLAND, off Cape Cook, Brooks Peninsula, NW coast Vancouver Island, 50°07' N, 127°56' W.

1954, July 1. Nesting in large numbers (Guiguet 1955); an immense colony comparable to Triangle; adults (11 secured) on eggs, all heavily incubated (CJG MS).

CLARK ISLAND, E Grassy Island, Barrier Islands Group, Kyuquot Sound, outside Kyuquot Channel. 49°55' N, 127°14' W.

1958, June 28. 2 nests excavated, 1 egg each (CJG MS).

CLELAND ISLAND (old name Bare) W Vargas Island, Clayoquot Sound, S Brabant Channel. 49°10' N, 126°05' W.

1930, May 9. Many burrows noted; 1 adult taken at burrow entrance; too early for eggs to be collected. (IMcTC MS).

MANDARTE ISLAND (other names: Bare, Ridge), Haro Strait, E Miner's Bay, central E shore Sidney Island, 48°38' N, 123°17' W.

(1891) Fannin (1891) says "breeds on the islands of the Gulf (of Georgia)"; repeated in his 1898 list.

(1904) Kermode (1904) says breeds on Bare Island near Sidney.

1908, June 25. 1 egg collected by E. M. Anderson (PM; note misprint M-C: 125).

c1910. Not more than 3-4 pair when H. Spalding (pers. comm.) made his first visit here about this time.

1915, June 15-July 28. W. B. Anderson (1916) warden on the island during this period, noted three pair about the island; nests are not mentioned. He states that they "used to be plentiful."

1916. 4 pair noted about the island, according to Kermode (1917).

1922. J. W. Winson, warden on the island for one month, writes me that there were 2 pair about the island.

1927, July 21. Munro (1929) who did not mention puffins on his earlier visits (1921, 1923) estimated 15 pair present, an "increase over the 5-6 pair usual in recent years." This count was probably too high; his gull estimate on this trip is also suspiciously high.

1936, June 12. 1 egg collected by WSM in a rock crevice, 5 ft. back from opening, in what was probably a natural hollow (WSM coll.).

July 8. Munro (in M-C: 125) estimated 2 pair present.

1940, c. May 20. Dr. G. C. Carl (in litt. 23.xii.60) photographed an adult leaving a rock crevice, where investigation revealed an egg in the innermost corner, apparently this species. Only one pair was noted about the island.

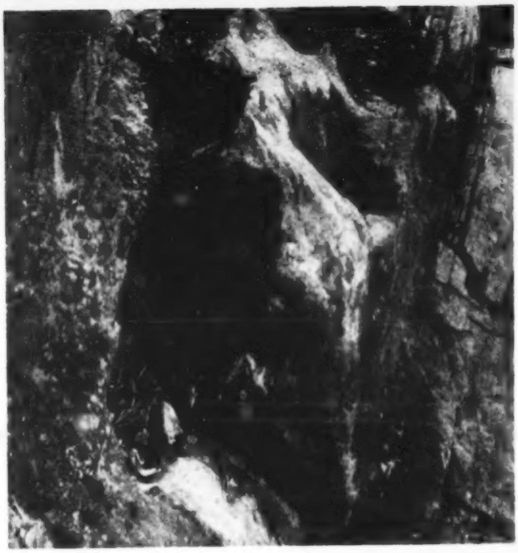


Fig. 53.
Mandarte Island. Aug. 31, 1960. R. Drent. Tufted puffin: a typical nest site on southern coast. Natural rock cranny, 40 inches long (entrance in shadow) used here, bed of grass at inner end. 1 young successfully raised 1959 & 1960 (empty this date).

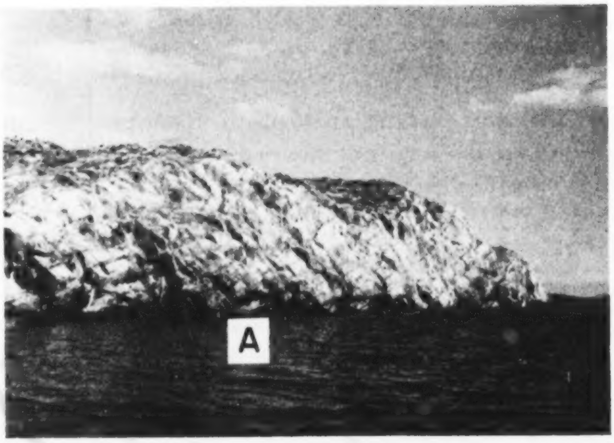


Fig. 54.
Mandarte Island. Aug. 31, 1960. R. Drent. Tufted puffin: nesting habitat at this colony, NW cliffs along with double-crested & pelagic cormorants and pigeon guillemots; glaucous-winged gulls along crest. Nest site above A.

1953, June 27. The Victoria Natural History Society field group noted 1 pair (A. R. Davidson).

1955, June 2. Vic. NHS noted 2 pair (A. R. Davidson).

1958, July 3. 1 egg found in natural rock cranny, replaced after photographs had been taken; nest found by observing adults (J. Toochin, BCNRS).

1959, July 25. At least 2 pair had been noted hanging about the island through the summers of 1957-58 and G. F. van Tets found the first nest this date (search being limited to banding periods each season). A single downy young was found, in a 40" natural rock tunnel (see Fig. 53).

August 22. An adult bringing feed, probably to this nest.

1960, July 31. A second nest was found, the adult apparently incubating in a narrow crevice, perhaps 10' from entrance, far up the cliffside; the bird could not be reached (R. Drent, BCNRS).

August 2. Another chick was banded in the 1959 nest visited again August 31 the chick had flown (G. F. van Tets & R. Drent, BCNRS). We believe that only 2 pair nested on the island in 1960; thus both were accounted for.

Insufficient data:

ROCK ISLAND, Queen Charlotte Sound.

An egg was collected here by W. Raine, June 28, 1890 (#556 in the National Museum Collection, Ottawa), but this island cannot now be located.

HYPOTHETICALS--UNSUBSTANTIATED REPORTS

Here treated are published reports of colonies based on what we consider insufficient evidence. Vague general records (e.g. "west coast of Graham Island") are not included. ** indicates species not proven to nest in British Columbia.

Double-crested cormorant Phalacrocorax auritus

Darcus (1930) reported one pair breeding on Langara Island amongst the pelagic cormorant colony in 1927. Without specimen evidence (eggs, young) or adequate photography this record, so far from known sites, both to north and to south, cannot be accepted.

Brandt cormorant Phalacrocorax penicillatus **

The only report of nesting in British Columbia (Brooks & Swarth 1925: 31; Solander Island July 22, 1904, Brooks MS) was based on presence of birds there in summer (M-C: 52). At present this cormorant is known to nest only as far north as Washington. We can expect colonies to be established in the Gulf Islands in the near future however: this cormorant nests in the San Juans (Lopez & Matia, Jewett et al. 1953: 83-84; Colville (see Goodge 1950) only fortuitous, Mrs. Z. M. Schultz in litt. 19.v.60). Large numbers have been roosting on Mandarte Island, B. C., since at least 1957, with adults present outside the breeding season, and immatures throughout the year; courting and the building of play nests has been observed (see van Tets 1959). It seems clear that we are witnessing the preliminary colonization phase, occupation of the site by immature birds during the breeding season (see Fisher 1954).

Pelagic cormorant Phalacrocorax pelagicus

Bent listed Sidney Island, B. C., as a breeding site (1922: 278). An egg record (3 eggs, July 10, 1900, coll. E. M. Anderson) in the PM collections, supplied Bent by F. Kermode was no doubt the basis for this record. Since Sidney Island has practically no suitable terrain for this cormorant (extreme S end only) and Mandarte Island adjacent almost certainly had a colony then, I believe this merely represents a general rather than specific locality designation.

Western gull Larus occidentalis **

Pearse (1946a) has suggested that a few pair of this species (currently accepted range north to Olympiades, NW Washington) may breed amongst the glaucous-winged gull colony on Seabird Rocks, Pachena Bay, southwest coast of Vancouver Island (sight records August 19, 1943 and August 12, 1945) and further that hybridisation may occur between the two. This touches a complex situation, requiring collection of breeding birds and detailed study, for toward the southern part of its range the glaucous-winged gull shows western features: thus breeding birds on Mandarte Island, B. C. show black wing-tips not at all infrequently (see variation in members of pair, Fig. 22). Mrs. Z. M. Schultz is undertaking a study of plumage variation in the glaucous-wing, and reports (*in. litt.* 4.xi.60) that she has specimens showing gradation toward the western gull in mantle and wing-tip colouration as well as primary pattern, and feels that hybridisation is implicated (see also note of Dawson [1908] to this effect). Pending further work this breeding record must therefore be regarded as an interesting possibility only.

Common murre Uria aalge

Brooks & Swarth (1925: 25) reported colonies at Solander Island and "near Ucluelet," in addition to that at Triangle. We can find no definite basis for these; nor have they been accepted by Munro & Cowan (1947: 122). Guiguet (MS) investigated Solander Island July 1, 1954, and found no murres nesting, and no evidence that they had done so in the past. The Ucluelet site remains an open question.

Cumming (1930) reported taking a fully formed egg from a bird collected at Langara Island, QCI, July 19, 1930. This record was listed by M-C (122). Guiguet has worked Langara thoroughly (especially 1946/47 and 1952) and although murres roost in small numbers he has obtained no evidence for nesting (cf. Guiguet 1950). Exploration on the west coast of Graham Island (S Langara) has likewise yielded no colonies to date, so we feel the safest interpretation of Cumming's record is that a bird from the large colony on Forrester Island, SE Alaska, some 40 miles NW, was involved.

Marbled murrelet Brachyramphus marmoratum

Available reliable evidence for the nesting of this bird in British Columbia has been discussed above. There are in addition several doubtful eggs, briefly summarized by Young (1930), all from the Queen Charlottes.

a) 1 collected 1901 by C. F. Newcombe in "Queen Charlotte Islands"; I have found no other mention of this record.

In the ROM collections there is an egg, allegedly this species, donated by R. A. Cumming, with no data further than "Queen Charlotte Islands." I am completely baffled by this record unless it be Newcombe's egg. Cumming (who died in 1937) stated conclusively, reporting on his collecting trip to the QCI in 1930 (1930); "Though careful investigation was made no evidence of this species nesting was obtained." L. L. Snyder has kindly searched for more data on this egg, but could find only the letter, referred to below, making it still less likely that Cumming himself ever claimed to have found an egg of this bird.

b) 1 collected by C. deB. Green. This find was never properly recorded, but by assembling Bowles 1920, 1929, Brooks 1926, 1930, and Taylor 1921 the following emerges: the single egg was collected from a burrow on Cox Island, Cloak Bay, QCI (not Banks Island as Young has it), July 22, 1920, no adult being on the nest. The egg was presented to Bowles, but can no longer be found in his collection (now in Puget Sound Museum of Natural History, Tacoma; Dr. G. A. Alcorn, Director, *in. litt.* 18.x.60). In any case both Bowles and Brooks were careful to point out that identity was "probable" at best, and the record, without capture and preservation of the female, suggestive only.

c) The most famous records were made by Darcus, again on Cox Island (for clarification of locality see his 1931 paper). He reported (1927) finding a breeding colony of some 20 pair May 14, 1927, (after preliminary search 1926) taking 3 fresh eggs from burrows (1 per set), and a further one on May 15; no adults were captured and preserved however.

d) Two further eggs brought from the same locality to Young (1930) "but considered by (Young) quite doubtful." No doubt it was one of these eggs that Shore-Baily received from Young, and displayed to the British Ornithologists' Club in London in 1931 (see Shore-Baily 1931); "(the egg) is rather smaller than that of the ancient murrelet, but similarly marked"; this is definitely not true of the marbled murrelet.

We feel that all of these eggs, stemming from a known colony of the ancient murrelet (with the possible exception of Newcombe's mysterious record) represent misidentifications of variants of that species. It is significant that Cumming, Guiguet, and Stewart, who all worked Cox Island in full knowledge of previous discoveries there, were unable to uncover any additional evidence for the marbled murrelet nesting. Such doubts have been expressed before (Pearse & Cumming by W. A. Newcombe, *in litt.* to C. J. Young, 23.ix.34, ROM files; by a Mr. Peve, resident on Langara Island for 35 years, Guiguet 1946 MS), and there is little point in reviving these old controversies. We still await the definitive discovery of a marbled murrelet's nest: ample documentation (which the above all lack) must be provided before any record for this elusive bird can be accepted.

CHANGES ON THE SOUTH COAST

When the scattered records are assembled there is definite evidence for change over the years, viz.:

Double-crested cormorant

This bird has colonized the inner coast of British Columbia and Washington starting c. early 1920's; subsequent expansion and increase have been given in detail above; available figures for British Columbia colonies are listed here:

1. Ballingall

c.1920	first nesting
1936	23 pair
1939	33 pair
1957	74 pair
1959	59 pair

2. Mandarte

1927	1-3 pair; 1st record
1932	1 at least
1935	5 pair
1936	9 pair
1942	15-20 total
1945	23 in original group; total perhaps greater
1953	c.145
1960	c.135 no marked change 57-60

3. Channel

1951-52	first nesting
1959	16 pair

4. Admiral

1956	8-9 pair; 1st record
1959	9 pair

Pelagic cormorant

St. John Point (after 1938), Mitlenatch (c. 1949), and Trial Island (1956) are all new colonies; Mandarte has shown enormous increase since first census in 1915; available counts:

Mandarte	
1915	25 pair
1936	164 pair
1959	375 pair

Mitlenatch	
1949	18 pair at least
1959	143 pair
1960	155 pair

Trial	
1956	1st record
1960	107 pair

Thus the increase and expansion noted by Pearse (1956) for the northern strait has been general.

Glaucous-winged gull

Colonies where figures are available over long periods all show increases:

Mandarte	
1915	225 pair
1921	350
1923	600
1927	(1000) quest.
1936	534
1955	1500
1957-60	1800-2000

Mitlenatch	
1922	250 pair
1925-28	400
1959	600
1960	?900

Java Islets	
1900	30-40 pair
1959	158

Imrie	
1935	150 pair
1959	200
1960	300

Pigeon guillemot

Accurate counts are so difficult to obtain that the present material does not allow any conclusion.

Tufted puffin

Only one known south coast colony: Mandarte. Although many have declared that the puffin has seen better times there (e.g. Anderson 1916, and Alford 1928 who wrote "many hundreds used to breed, but when I last visited the island [sometime 1912-20] not a puffin was seen"), no definite evidence can be found in this view. As far as the records go back (1910) the nesting population has been small but constant. When the limited number of sites available is taken into account (no burrowing terrain) it seems unlikely that the population has ever been large.

c 1910	3-4 pair at most
1915	3
1916	?4 (second hand)
1922	2
1927	(est. 15 questioned)
1936	2
1941	1
1953	1
1955	2
1957-58	2-3 **
1959	2 **
1960	2 **

Occupied nests reported:

1908	1
1936	1
1958	1
1959	1
1960	2

** Based on observation throughout the summer

Munro's count for 1927 seems surprisingly high; also his statement that 5-6 pair had been usual in preceding years (no previous counts had been given by him). His gull count for this visit was also evidently too high, so this may well have been a day of over-estimation (poor conditions, short time only, etc.). In 1936 he estimated 2 pair.

Some speculations

Both species of cormorant and the glaucous-winged gull have shown great increases since the first available counts in the period 1900-20. This is not the place to discuss underlying causes at length, but the following factors have no doubt played a part.

First, the amelioration of climate in our latitudes over the past century (in western Europe since about 1850, see Crisp 1959 for recent review; in B. C. Cowan 1940 has given some figures for Victoria) could easily have brought about an increase by: (1) extending the breeding season and decreasing bad-weather mortality of the chicks, resulting in an increased production of young. For the double-crest for example, weather may easily determine if one or two broods are raised in that particular season. (2) Milder winters, increasing survival, especially through greater availability of food. (3) Possible increase in food supply, through changes in distribution and abundance of fish, invertebrates, etc. (Such changes have been demonstrated in Europe.)

Secondly, the influence of man has no doubt been critical. Indians had always used the colonies as food sources, but with more and more fishermen taking part "egging" reached alarming proportions (see Anderson 1916, Higgs 1918, Pearse 1923, 1929) so that to save the colonies wardens were posted on Mandarte and Mitlenatch (see Kermode 1914-18, Pearse 1923). The egging custom has gradually disappeared, I think not so much through discouragement by law and warden, but rather the eating of sea-bird eggs has gone out of fashion. Indians have the right to gather eggs on Mandarte, for example, but rarely exercise that privilege anymore. In any case, the pressure of persecution eased somewhat by the 30's-40's, allowing the sea birds to realize their reproductive potential. Now, however, the interference by man is again becoming serious, as will be discussed in the next section.

The rise of human population has vastly increased the food supply of the glaucous-winged gull, a common scavenger about the onshore fishing fleet, canneries, harbours, big city garbage dumps, etc. This may be especially important in enhancing winter survival of the inexperienced young birds: Woodbury & Knight (1951) have shown by analysis of band returns that the peak juvenile mortality falls between November-February. Over the winter months the opportunity to work the intertidal zone, an important feeding area, is severely limited, hence the exaggerated importance of supplementary food sources. This restriction is due to the pattern of tides, the degree and duration of low water of course being the critical factors. Along our coast the tides are of "mixed" type, meaning that either but one marked low water is experienced per 24 hours, or two slight ones; thus at best only one good opportunity per cycle is offered the gulls to feed on the intertidal. In the winter months these distinct lows fall at night (opposite to summer), so the gulls have practically no chance to utilize this food source.

Man can have had no such direct effect on the food supply of the cormorants, however; food studies on Mandarte to date indicate a diet of "scrap fish," i.e. those of no commercial value; no exploitation of man-caused accumulations noted.

Finally there exists the possibility of some change in the attributes of the bird: the double-crest has expanded its range and numbers on the eastern seaboard (Fisher & Lockley 1954: 58, Gross 1955) and is expanding in Ontario and Manitoba (Baillie 1947, McLeod & Bondar 1953) so perhaps we in British Columbia are witnessing part of some remarkable range change (as in the collared turtle dove [Streptopelia decaocto] in the old world). It should be pointed out, however, that the double-crest has undergone range retraction in the Aleutians since early reports (1906; see Murie 1959: 52-55).

This discussion is mere speculation, but should make clear that a close watch on our colonies in future should prove highly interesting; and it is precisely the "commonplace" gulls and cormorants, so often neglected, that offer the most promising material. Well-timed nest counts make accurate census of these species a practical proposition. It is hoped that tallies will continue to come into the BCNRS files, or that observers publish their data in precise form.

MAN AND SEA BIRDS TODAY: A PLEA FOR PROTECTION

I have said that part of the cause for increase in gulls and cormorants over the past 50 years has been the gradual abandonment of "egging." A new form of disturbance is now making itself felt, however, and has already reversed the trend of increase at several colonies. This threat is "misguided tourism." The postwar craze for small motor boats, especially ever speedier outboard models, has filled south coast waters with swarms of whining "sharks" that penetrate every channel. Formerly small boating was confined to relatively slow inboards, and fishing was the primary objective. Now, however, a new class of boat enthusiasts is involved, with often no goal in mind other than to cover distance at speed; landing on islets here or there breaks monotony of travel. The result has been an ever-increasing disturbance of the more accessible colonies. Those with definitely malicious intent are few; the damage is caused by curious but well-meaning folk.

The disturbance is critical to the success of the colony through loss of eggs and young. Most of our colonies have northwestern crows forever in attandance, scavenging for fish scraps, etc.; their role is ordinarily a harmless and even beneficial one. When the human intruder frightens the sea birds from their nests, however, the crow is quick to seize the opportunity to plunder eggs and small young: cormorant, gull, and even pigeon guillemot suffer. Gulls, although generally less adept at this work, will join in if the disturbance is prolonged, taking eggs of cormorants and other

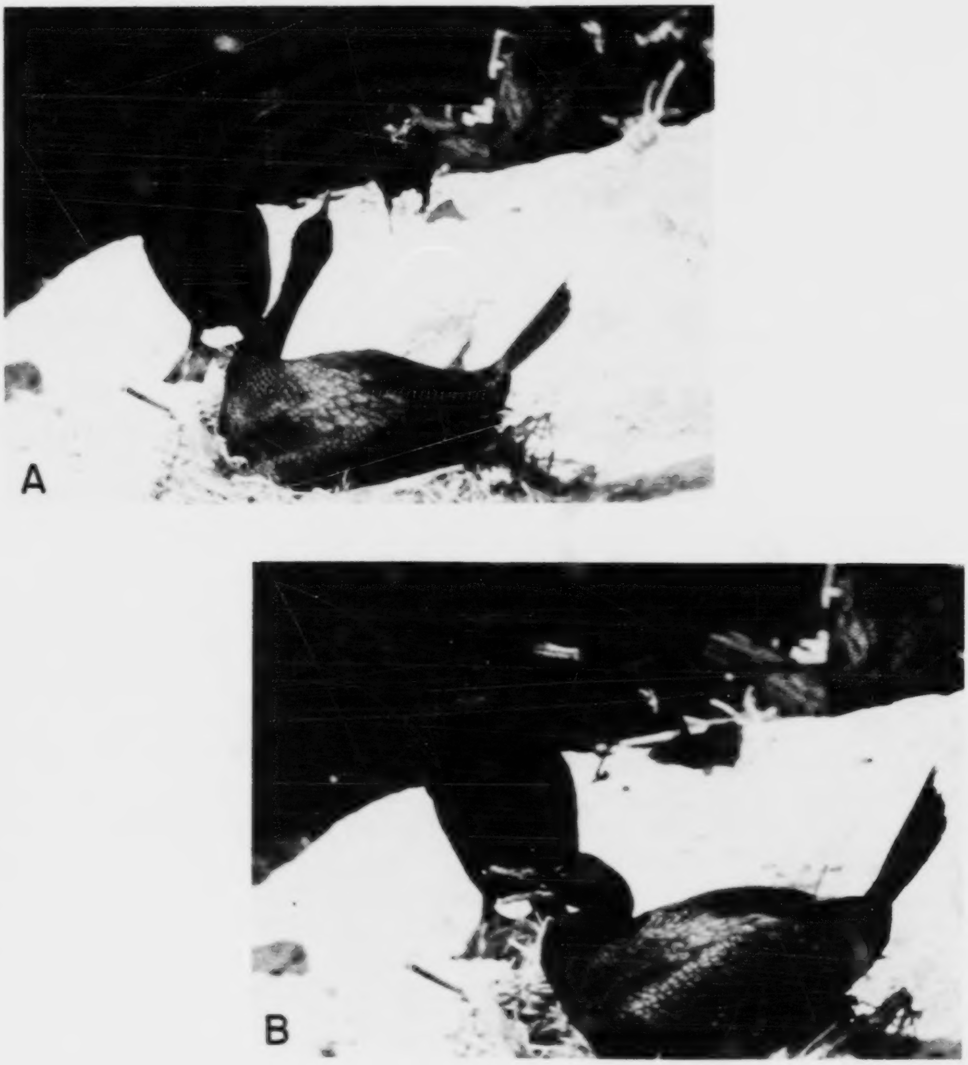
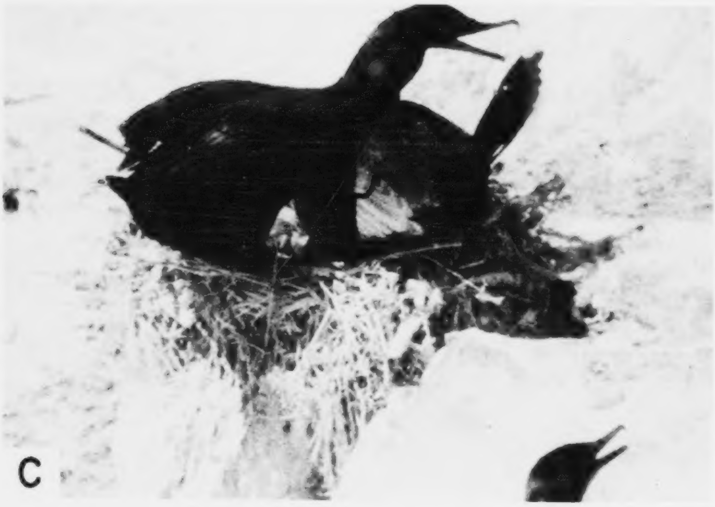
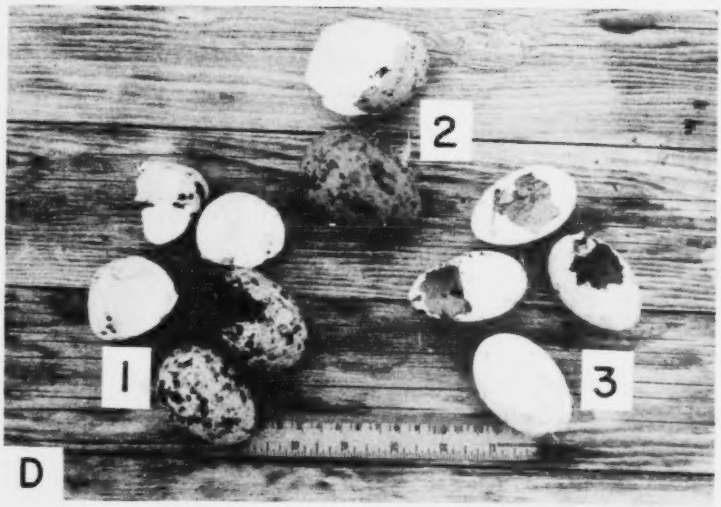


Fig. 55 (also opposite)

The crow problem. A-C attempted predation of small double-crested cormorant chicks, Mandarte Island, June 28, 1960. At (A) crow scavenging fish scraps in the colony shows interest in pair about to change guard on 2 small chicks: one 3 and the other 4-5 days old. Note threat of cormorants. At (B) crow poised to dash in at the critical moment; the cormorants are too clumsy to drive it away, and in any case another would soon take its place. At (C) the moment of exchange; the glistening naked young exposed between the parents; crow just off picture to upper right (note threat). At





this point the relieving mate (at left) backed off and the original bird settled to brood the young again; this performance was repeated over and again for at least 30 min., when observer left blind. Each time a crow (not always same) dashed in when the young were exposed, and the old guard hastily covered them again. Results when man chases the cormorants from the nest can easily be imagined. (D) shows crow-pecked eggs, with a sound egg for comparison, (1) pigeon guillemot, (2) glaucous-winged gull, (3) cormorant spp. The empty shells are examples taken from the heaps lying beneath crow nests and strewn about hideaways where the crows took the eggs to eat them undisturbed. (Mandarte 1960) (Photos R. Drent) gulls, to be devoured on the spot. The crow usually makes off to a protected spot before eating his plunder; accumulations of pecked eggs in his hideaways tell the tale, see Fig. 55D. In addition, when cormorants are suddenly frightened from the nest a certain number of eggs are accidentally dislodged and lost or broken; and upheaval of a gull colony with young will cause many chicks to stray from their parental territory, so that they will be later attacked by strange adults, and many killed before they manage to work their way back to the home territory.

Lest this gloomy picture seem an exaggerated one, here are some figures on direct loss through crows: 2 banders ringed young double-crested cormorants at their nests on Mandarte Island, July 8, 1960. They worked as quickly and quietly as possible, to minimize disturbance, but kept a part of the parent birds from the nest during the 45 minutes required. (c. 120 nests, 93 young banded) A third observer (Dr. M.D.F. Udvardy, UBC) kept close watch of marauding crows during this time, and counted 25 eggs and 8 newly hatched young carried off; actual loss was undoubtedly somewhat higher. Loss by gulls was nil.

Even without outside disturbance, crows, scavenging the cormorant colonies for fish scraps dropped in feeding young, etc., are quick to steal eggs and small young the moment the parent is off guard; in 1960 I have observed from a blind crows attempting to grab both young double-crest and pelagic chicks (Mandarte Island). Attempts to snatch newly hatched double-crest young when the parents change guard are illustrated here (Figs. 55A-C) Blame the crows? Not at all; they are a part of the natural environment. Our colonies have expanded in the face of constant presence of crows; many even support nesting populations (thus Imrie Island had 2 pair, and Mandarte 25 in 1960). The vital point is that too-frequent disturbance by man upsets the natural relationship and, given this artificial opportunity, crows can very effectively cut off successful reproduction by the sea birds.

Hard facts have been given for the destructive potential of the crow, and other sources of loss outlined. Outcome on the colony is made obvious by comparison of disturbed versus non-disturbed sites.

Double-crested cormorant

1. Ballingall Islets (heavily disturbed).

Nesting population on the decrease (74 in 1957 to 59 in 1959)

Production of young practically nil:

Aug. 8, 1957:	74 nests, total 8 eggs no young; it is absolutely certain that no young were raised this season
June 28, 1959:	59 nests, of which 31 tallied: 21 with eggs, none with young; distinctly later than Mandarte, but with a slim chance to raise young this season

2. Mandarte Island (protected by resident UBC observers; not from crows but from people)

Nesting population steady at ca. 150 pair

Good crop of young each season.

G. F. van Tets has calculated 2.4 chicks raised per pair for a carefully watched sample in both 1958 and 1959; lest disbelief be voiced because of small sample size, the figures for young banded (only those sure to survive are banded) give a gross picture, but are bound ever to lie below the true totals:

1957:	147	compares with 0 for Ballingall, half the colony size
1958:	218	
1959:	386	191 were banded June 29; cf. Ballingall above
1960:	117	

Pelagic cormorant

1. Christie Islet (small colony heavily disturbed)

Nesting population declining rapidly after initial increase.

Production of young now nil.

Year	Banding Total	No. pairs
1950	(3)	25-30, incl. Pam (banding incomplete)
1952	22	---
1953	23	---
1954	27	---

Year	Banding Total	No. pairs
1956	25	20-35 pair, incl. Pam; 15 on C., eggs & yng.
1958	45	24 on C., eggs & yng; Pam group gone
1959	0	8 on C., eggs only
1960	0	few on C., all empty (checked specially)

Date of visit varied by only a few days throughout the period; coverage became increasingly complete (additional help).

2. Trial Island (large colony heavily disturbed)

Effect on colony size not yet evaluated (established 1956)

Production of young in 1960 practically nil:

1960. Nest tallies June 12 & 19 & July 14 (resident lightkeeper, D. H. Franklin, who attests frequent disturbance). Eggs were laid in at least 96 of the total 107 nests, but from the total of at least 327 eggs only 12 chicks were raised.

3. Mandarte Island (large colony, protected by resident UBC observers)

Nesting population increasing (see "Changes" section).

Good crop of young each season.

G. F. van Tets has calculated chick production per pair by two different methods, and finds good agreement: 1.9 & 2.0. A gross measure is again supplied by the banding totals (only older chicks almost certain to survive; number less than actual production; coverage of cliffside cannot be 100% complete).

1957: 253
1958: 227
1959: 530
1960: 300

4. Race Rocks (small colony, protected only since 1953)

Nesting population increasing.

Good crop of young each season.

G. C. Odlum, lightkeeper here, writes that his predecessor disliked the strong odour of the birds and destroyed eggs in an attempt to break up the colony; since he was stationed here in 1953 he has left the birds strictly alone, taking nest counts during egg-laying but not following production of chicks (which is generally high Odlum writes) for fear of disturbance; visits by strangers not to be reckoned with on this remote group.

1953-55	Nesting
1956	23 nests plus
1957	21 nests
1958	27
1959	45 new subcolony established

Glaucous-winged gull

Results of disturbance are not nearly as drastic in this species, but they are still noticeable. Unfortunately I have no figures to supply for an "undisturbed" colony to counter those for Christie, for the basic need is to provide figures for production of young. Banding figures are a gross measure, but on Mandarte (protected) coverage is not nearly complete enough for comparison to Christie.

Christie Islet & Pam Rock (heavily disturbed)

Nesting population possibly dwindling; more figures required.

Production of young definitely down.

Banding totals	
1954	1000 (previous years incomplete coverage)
1956	904
1958	610
1959	385
1960	561

Nest tallies on Christie

None available for this period-
June 26, 1955 count incomplete.

1956	419 almost comp.	(26.vi.)
1958	219 complete	(22.vi.)
1959	299 complete	(21.vi.)
1960	none available	

The nest counts to right may be misleading to a certain extent, for the result of disturbance is to protract egg laying; possibly more nests would be started after the end of June visits (normally little egg-laying can be expected after mid-June).

Recommendations

The evidence is clear: if the south-coast colonies are to continue, human disturbance must be curbed. All the nesting sea birds on our coast are already protected by law: it is unlawful to kill, hunt, capture, injure, take or molest auks, auklets, guillemots, murres, puffins, gulls and petrels (among others), or to destroy, take or molest nests or eggs of these birds (see Migratory Birds Convention Act and Migratory Bird Regulations, 1960 ed., administered by Canadian Wildlife Service). The only species not covered by this federal law, the cormorants, are protected on our coast by the British Columbia Game Act.

The regulations are there; the problem is primarily one of public education. Once the over-enthusiastic visitors can be made to realize the damage they are inflicting, the great majority desist of their own accord. In the meantime, practical measures would be desirable for the three presently threatened colonies, viz., Ballingall Islets (our oldest and most picturesque double-crested cormorant colony), Christie Islet (the closest sizeable sea-bird colony to Vancouver, main site for the scientific gull-banding programme of the Western Bird Banders' Association [Vancouver chapter], and for guided educational tours by the Vancouver Natural History Society), and finally Trial Island (largest pelagic cormorant colony in near vicinity of Victoria). If landing on these islands without special permission (for banding, census, etc.), or otherwise frightening birds from the nests were prohibited from May 15 to August 15 each season, the colonies would be given a chance for survival.

MAP SECTION

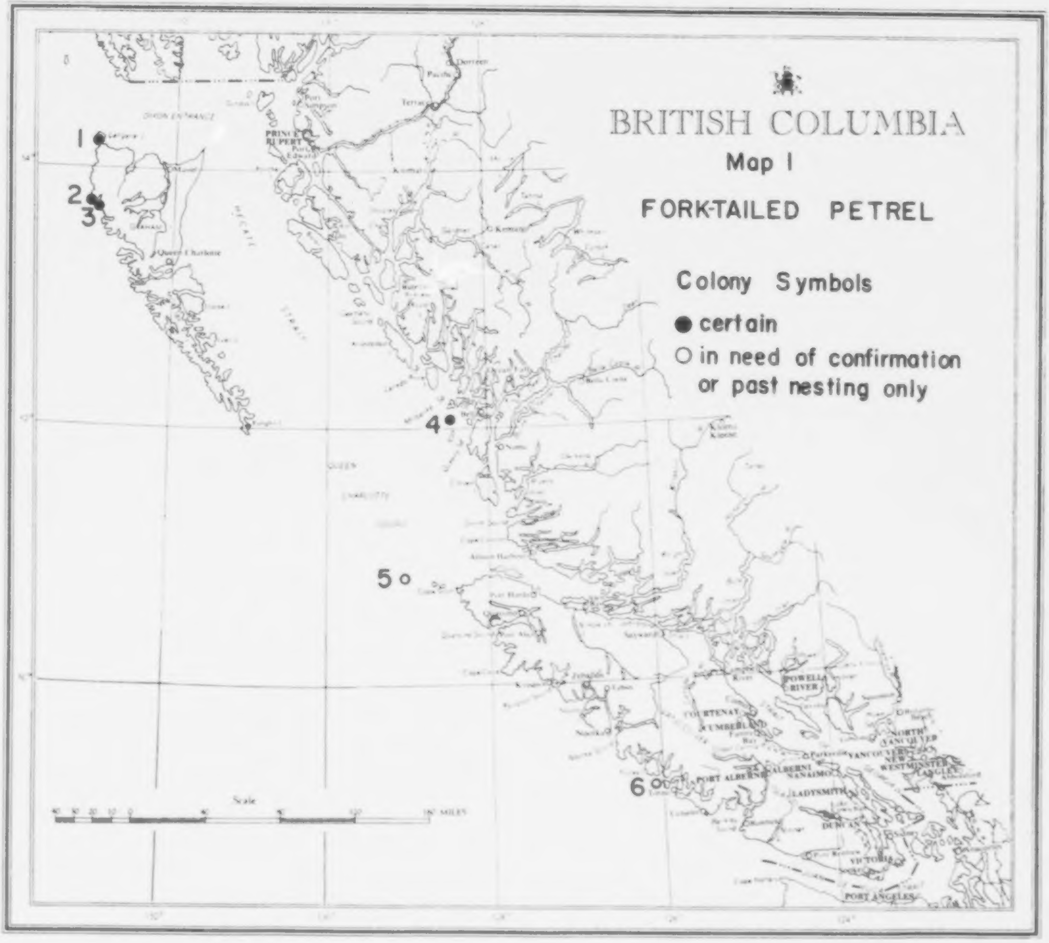
That these maps are incomplete owing to our scanty knowledge should be constantly borne in mind. Many sites require confirmation as current nesting grounds as is made clear by listing the latest year of definite nesting evidence for each. No colonies 4 pair or less are plotted. The colony descriptions given here are not complete (for which see text) but rather suggested form for those who may wish to quote this report, so that ambiguity in future references may be avoided.

Fork-tailed petrel Oceanodroma furcata		Map 1
Leach petrel Oceanodroma leucorhoa		Map 2
Double-crested cormorant Phalacrocorax auritus		Map 3
Pelagic cormorant Phalacrocorax pelagicus		Maps 4 & 5
Glaucous-winged gull Larus glaucescens		Maps 6 & 7
Common murre Uria aalge	(no map) see	Map 8
Pigeon guillemot Cepphus grylle		Maps 8 & 9
Marbled murrelet Brachyramphus marmoratum		Map 10
Ancient murrelet Synthliboramphus antiquum		Map 11
Cassin auklet Ptychoramphus aleutica		Map 12
Rhinoceros auklet Cerorhinca monocerata		Map 13
Tufted puffin Lunda cirrhata		Map 14

Map 1

(Latest year of definite nesting evidence given)

1.	Langara Island, QCI,	1952
	and	
	Cox Island, Cloak Bay, QCI	1952
2.	Tian Islets, QCI, west coast Graham Island	1947
3.	Ogilvie and Queen Islands, QCI, Port Louis	1947
4.	Fingal Island, McMullin Group	1948
5.	Triangle Island, Scott Islands	1909
6.	Cleland Island, Clayoquot Sound	1925


BRITISH COLUMBIA
Map I
FORK-TAILED PETREL
Colony Symbols
● certain
○ in need of confirmation or past nesting only
1
2
3
4
5
6
PRINCE RUPERT
Terrace
POWELL RIVER
COURTENAY
CUMBERLAND
PORT ALBERNI
NANAIMO
LADYSMITH
DUNCAN
NORTH VANCOUVER
VANCOUVER
NEW WESTMINSTER
VICTORIA
PORT ANGELES
Scale

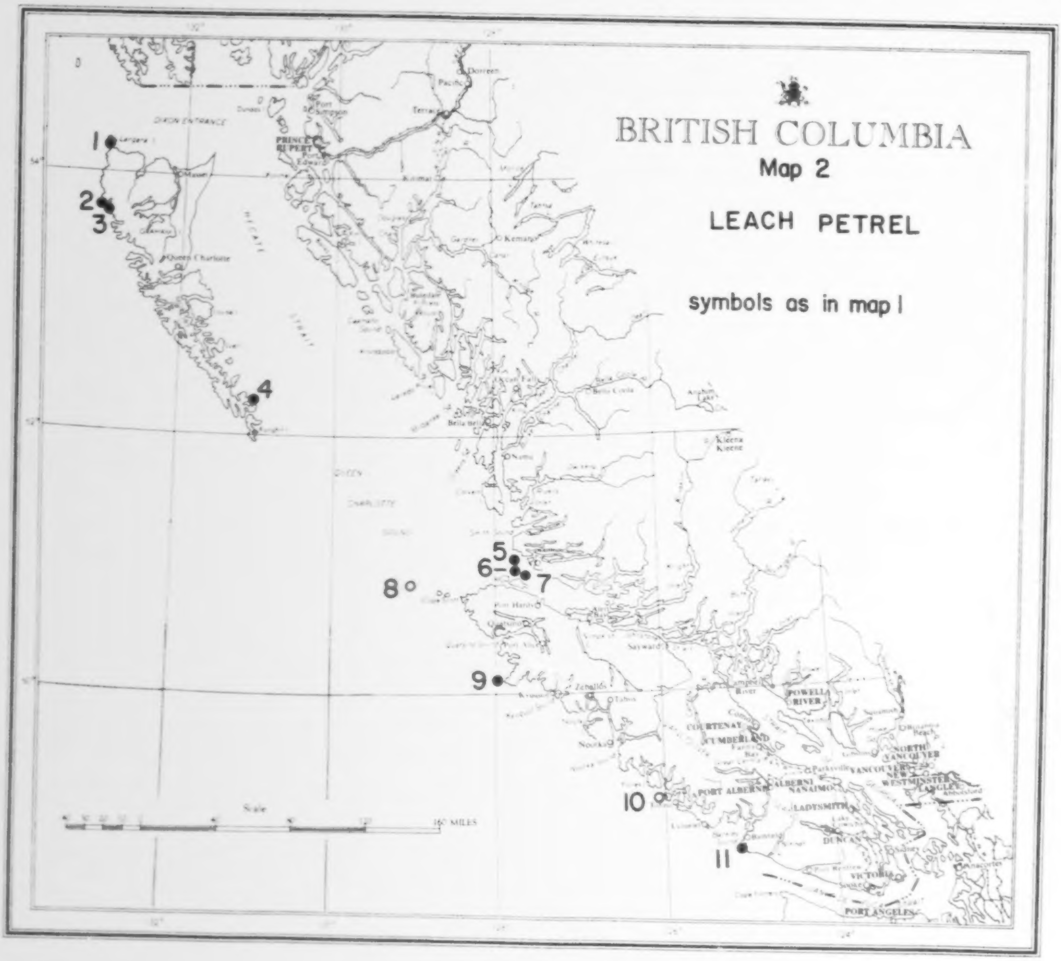
MAP 1

NESTING SITES OF THE FORK-TAILED PETREL
IN BRITISH COLUMBIA
Oceanodroma furcata

Map 2

(Latest year of definite nesting evidence given)

1.	Cox Island, Cloak Bay, QCI	1952
2.	Tian Islets, QCI, west coast Graham Island	1947
3.	Ogilvie, Queen, & Mackenzie Islands, Port Louis area, QCI	1947
4.	Rankine Islands, Carpenter Bay, QCI	1960
5.	Storm Islands, Queen Charlotte Strait	1929
6.	Pine Island & Tree Islets, Q.C. Strait	1929
7.	Buckle Group, Queen Charlotte Strait	1934
8.	Triangle Island, Scott Islands	1909
9.	Solander Island, off Cape Cook	1954
10.	Cleland Island, Clayoquot Sound	1925
11.	Seabird Rocks, Pachena Bay	1945


BRITISH COLUMBIA
Map 2
LEACH PETREL
symbols as in map I
1
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10
11
DIXON ENTRANCE
HECATE STRAIT
QUEEN CHARLOTTE SOUND
PRINCE RUPERT
Terrace
Kitimat
Kemano
Bella Coola
Bella Bella
Namu
Port Hardy
Zeballos
Tahsis
Nootka
Sayward
Campbell River
POWELL RIVER
COURTENAY
CUMBERLAND
PORT ALBERNI
NANAIMO
LADYSMITH
DUNCAN
VANCOUVER
NORTH VANCOUVER
NEW WESTMINSTER
VICTORIA
PORT ANGELES
Scale
160 MILES

MAP 2

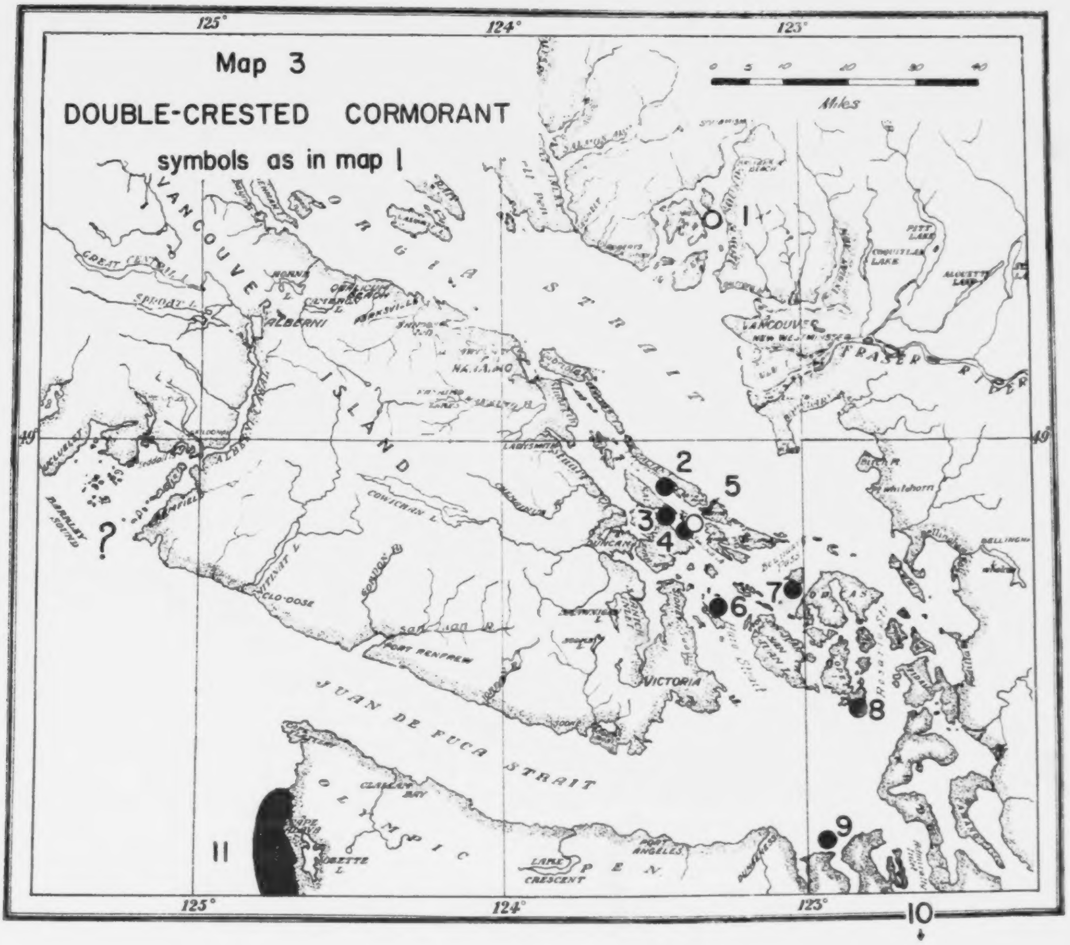
NESTING SITES OF LEACH PETREL IN BRITISH COLUMBIA
Oceanodroma leucorhoa

Map 3

(Latest year of definite nesting evidence, and approximate year of first nesting given)

		latest data	first nesting
1. Christie Islet, Howe Sound		1941 only	1941
2. Ballingall Islets, Trincomali Channel		1959	c1920
3. Admiral Island, Ganges Harbour		1960	1956
4. Channel Islets, Swainson Channel		1959	1951-52
5. Red Islets, SE shore Prevost Island		??1960	??1960
6. Mandarte Island, Haro Strait		1960	1927
7. Point Disney, Waldron Island	U.S.A.	1957	c1940-45
8. Colville Island, SE tip Lopez Island	"	1957	c1920
9. Protection Island, Port Discovery	"	1960	1959
10. Point No Point, Admiralty Inlet (off map)	"	1958	unknown
11. Olympiades (from Father & Son S)	"	heavy population in 1905-07	

Note question mark in Barkley Sound, B. C.: unexplored, nesting double-crests probable.


Map 3
DOUBLE-CRESTED CORMORANT
symbols as in map 1
125°
124°
123°
49°
0 5 10 20 30 40
Miles
VANCOUVER ISLAND
GEORGIA STRAIT
JUAN DE FUCA STRAIT
OLYMPIC PEN.
GREAT CENTRAL L.
SPROAT L.
ALBERNI
NANAIMO
LADYSMITH
COWICHAN L.
BARKLEY SOUND
UCLUELET
CLO-OOSE
PORT RENFREW
VICTORIA
VANCOUVER
NEW WESTMINSTER
FRASER RIVER
PITT LAKE
COQUITLAM LAKE
ALOUETTE LAKE
CLALLAM BAY
OZETTE L.
LAKE CRESCENT
PORT ANGELES
1
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11
?

MAP 3

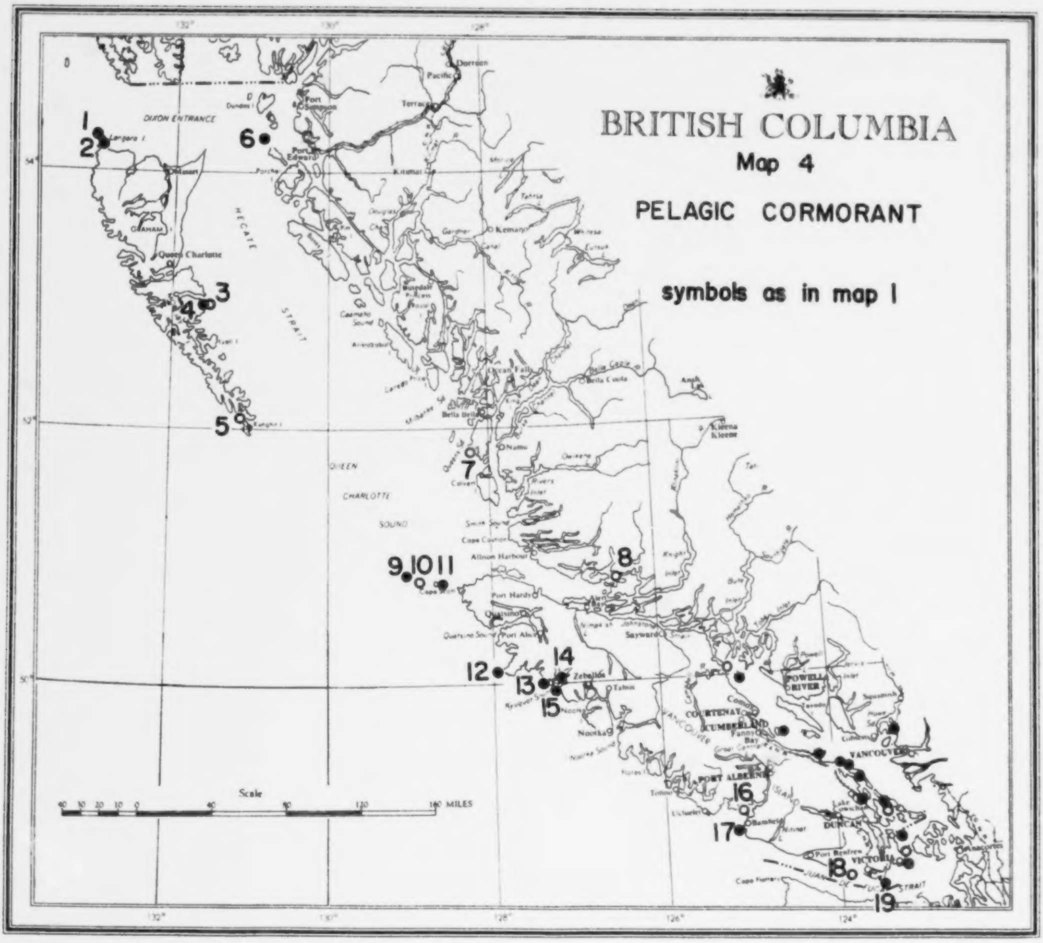
NESTING SITES OF THE DOUBLE-CRESTED CORMORANT
Phalacrocorax auritus
British Columbia and Northern Washington

Map 4

(Latest year of definite nesting evidence given)

1.	Langara Island, QCI: Langara Point	1959
2.	Langara Island, QCI: Iphigenia Point (abandoned since this date)	1946
	and	
	Cox Island, Cloak Bay, QCI	1952
3.	Skedans Islands, S. Cumshewa Inlet (open circle)	1900
4.	Skedans Point, Louise Island, QCI (solid circle)	1946
5.	Islets west of Kunghit Island, QCI	1900
6.	Unnamed islet south of Triple Islands, Brown Passage	1950
7.	Reefs off Blenheim Island, Queen's Sound	1948
8.	Vicinity of Deep Sea Bluff, Simoon Sound	1792
9.	Triangle Island, Scott Islands	1949
10.	Sartine Island, Scott Islands	1950
11.	Beresford Island, Scott Islands	1950
12.	Solander Island, off Cape Cook	1954
13.	Reefs south Amos Island, Kyuquot Sound	1957
14.	Hohoae Island, Kyuquot Sound	1957
15.	Clark Island, Barrier Group, Kyuquot Sound	1958
16.	Baeria Rocks, Barkley Sound	1960
17.	Cape Beale, SW entrance Barkley Sound	1959
18.	Sheringham Point, on Strait of Juan de Fuca	1958
19.	Race Rocks, Strait of Juan de Fuca	1960

(Remaining sites numbered on next map, no. 5)


BRITISH COLUMBIA
Map 4
PELAGIC CORMORANT
symbols as in map I
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19
DIXON ENTRANCE
HECATE STRAIT
QUEEN CHARLOTTE SOUND
Queen Charlotte
Prince Rupert
Terrace
Kitimat
Bella Coola
Bella Bella
Port Hardy
Zeballos
Sayward
POWELL RIVER
COURTENAY
CUMBERLAND
PORT ALBERNI
VANCOUVER
DUNCAN
VICTORIA
JUAN DE FUCA STRAIT
Scale
MILES

MAP 4

NESTING SITES OF THE PELAGIC CORMORANT
IN BRITISH COLUMBIA
Phalacrocorax pelagicus

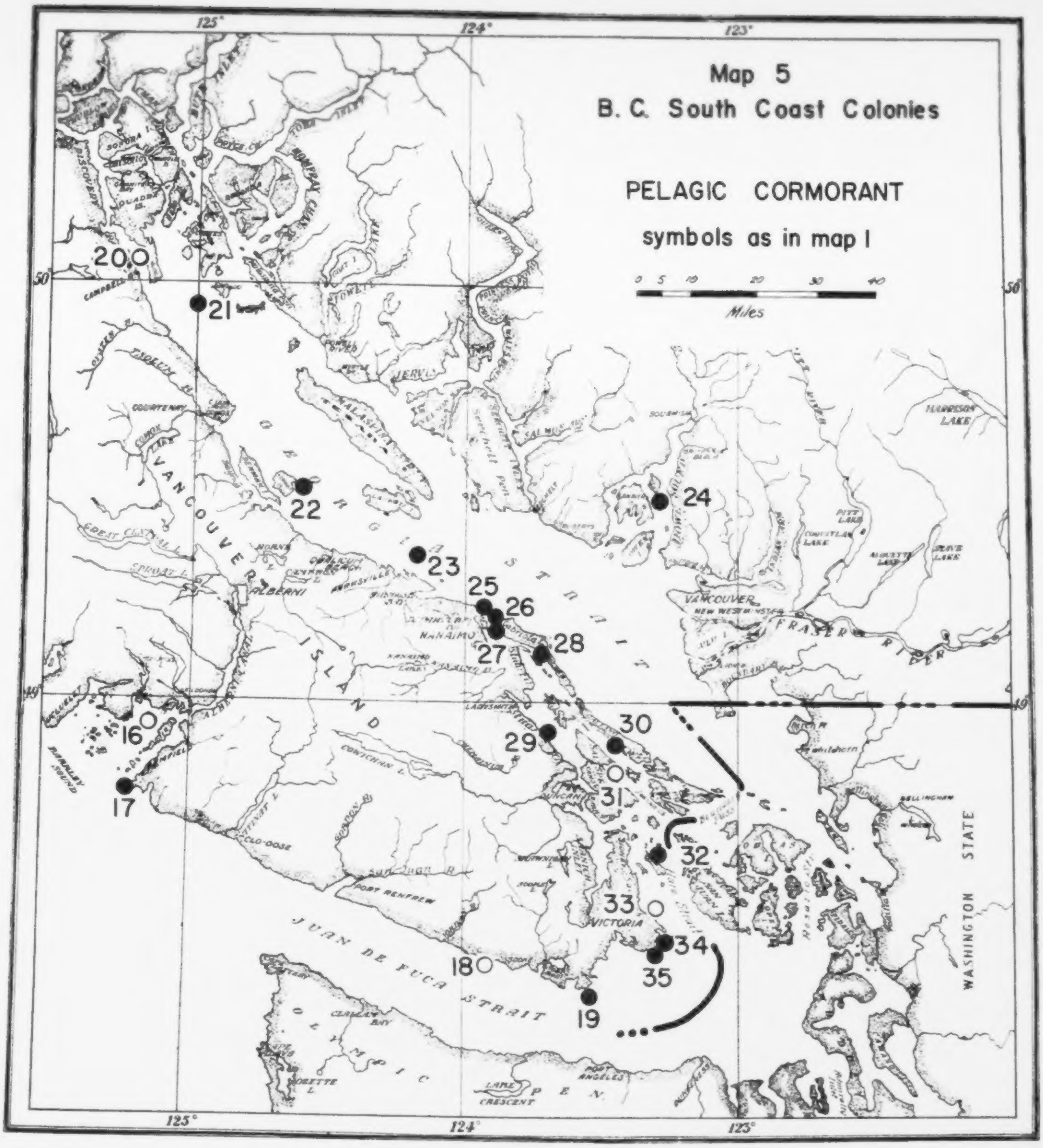
continued on Map 5

Map 5

(Latest year of definite nesting evidence given)

20.	Quadra Island, bluffs NW Quathiaski Cove	1959
21.	Mitlenatch Island, Strait of Georgia	1960
22.	St. John Point, Hornby Island	1960
23.	Ballenas Island, Strait of Georgia	1956
24.	Christie Islet, Howe Sound	1960
25.	Hudson Rocks, Horswell Channel	1960
26.	Snake Island, Rainbow Channel	1959
27.	Cliffs NW shore Gabriola Island	1960
28.	Valdes Island, cliffs in Pylades Channel	1955
29.	Bare Point, opposite Chemainus, V.I.	1959
30.	Ballingall Islets, Trincomali Channel	1959
31.	Chocolate Island, Ganges Harbour (abandoned since 1948)	1945-48
32.	Mandarte Island, Haro Strait	1960
33.	Gordon Head, Haro Strait	1959
34.	Chain Islets, off Oak Bay	1960
35.	Trial Island, SSW Gonzales Point, V.I.	1960

N.B. San Juan Islands (U.S.A.) not covered.


Map 5
B. C. South Coast Colonies
PELAGIC CORMORANT
symbols as in map I
0 5 10 20 30 40
Miles
125°
124°
123°
50°
49°
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35
VANCOUVER ISLAND
GEORGIA STRAIT
JUAN DE FUCA STRAIT
OLYMPIC PEN.
WASHINGTON STATE
CAMPBELL R.
COURTENAY
ALBERNI
NANAIMO
LADYSMITH
DUNCAN
VICTORIA
PORT RENFREW
VANCOUVER
NEW WESTMINSTER
FRASER RIVER
HARRISON LAKE
PITT LAKE
SQUAMISH
JERVIS
MALASPINA
PORT ANGELES
LAKE CRESCENT
CLALLAM BAY
BELLINGHAM
QUADRA IS.
SONORA I.

MAP 5

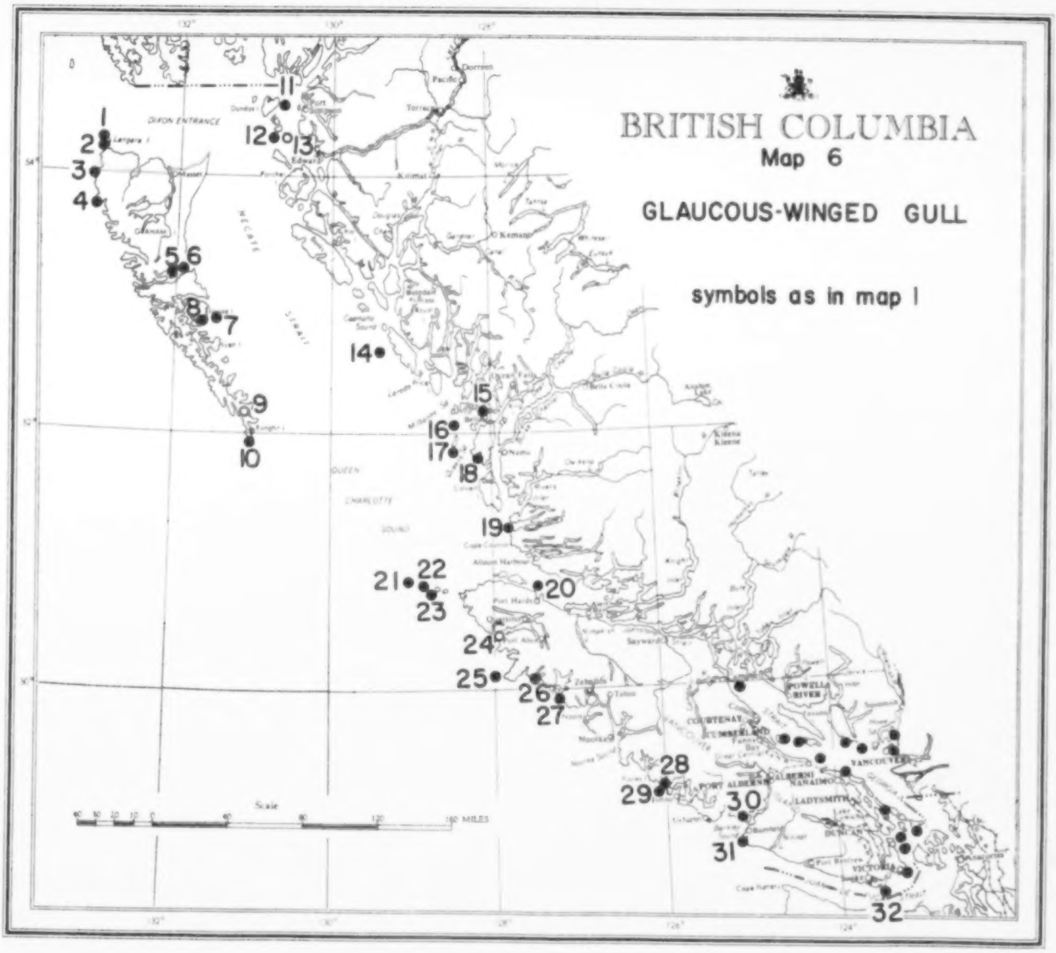
NESTING SITES OF THE PELAGIC CORMORANT
IN BRITISH COLUMBIA (cont' d)
Phalacrocorax pelagicus
South-coast colonies

Map 6

(Latest year of definite nesting evidence given)

1.	Langara Island, QCI: Langara Point	1959
2.	Cox Island, Cloak Bay, & adjacent shores Langara	1952
3.	Unnamed islet ("Grassy") between Morgan & White Points, west coast Graham Island, QCI	1947
4.	Tian Islets, west coast Graham Island, QCI	1947
5.	Balch, Gooden, & Maple Islands, Bearskin Bay, QCI	1946/47
6.	Rock of Skidegate Mission	1946
	and	
	Gillatt Island, west of Sandspit, QCI	1947
7.	Reef Island, SE Louise Island	1960
8.	Rock off Haswell Island, Selwyn Inlet, QCI	1946
9.	Islet in Houston Stewart Channel, QCI	1900
10.	Kerouard Islands, off Cape Saint James	1958
11.	Green Island, east Dundas Island, Chatham Sound	1958
12.	Unnamed islet south Triple Islands, Brown Passage	1950
13.	Lucy Island, Chatham Sound	(1947)
14.	Gander Group, W Moore Islands	1936
15.	Burial Island, bay at New Bella Bella	1959
16.	Fingal Island, McMullin Group	1948
17.	Gosling Rocks, South Goose Islands	1948
18.	Mosquito Islets, Kildidt Sound	1939
19.	Unnamed islet west Table Island, Smith Sound	1937
20.	Rocks south Doyle Island, Queen Charlotte Strait	1939
21.	Triangle Island, Scott Islands	1949
22.	Sartine Island, Scott Islands	1950
23.	Beresford Island, Scott Islands	1950
24.	Gillam Island, Quatsino Sound	(1958)
25.	Solander Island, off Cape Cook	1954
26.	Bunsby Islands (reefs south of), off Ououkinsh Inlet	1955
27.	Grassy & Clark Islands, Barrier Group, Kyuquot Snd	1958
28.	White Rocks, Calmus Passage, Clayoquot Sound	1930
29.	Cleland Island, Clayoquot Sound	1930
30.	Baeria Rocks, Barkley Sound	1960
31.	Seabird Rocks, Pachena Bay	1945
32.	Race Rocks, Strait of Juan de Fuca	1960

(Remaining sites numbered on following map, no. 7)


BRITISH COLUMBIA
Map 6
GLAUCOUS-WINGED GULL
symbols as in map 1
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32
DIXON ENTRANCE
HECATE
STRAIT
QUEEN
CHARLOTTE
SOUND
POWELL RIVER
COURTENAY
CUMBERLAND
VANCOUVER
PORT ALBERNI
NANAIMO
LADYSMITH
DUNCAN
VICTORIA
Scale
MILES

MAP 6

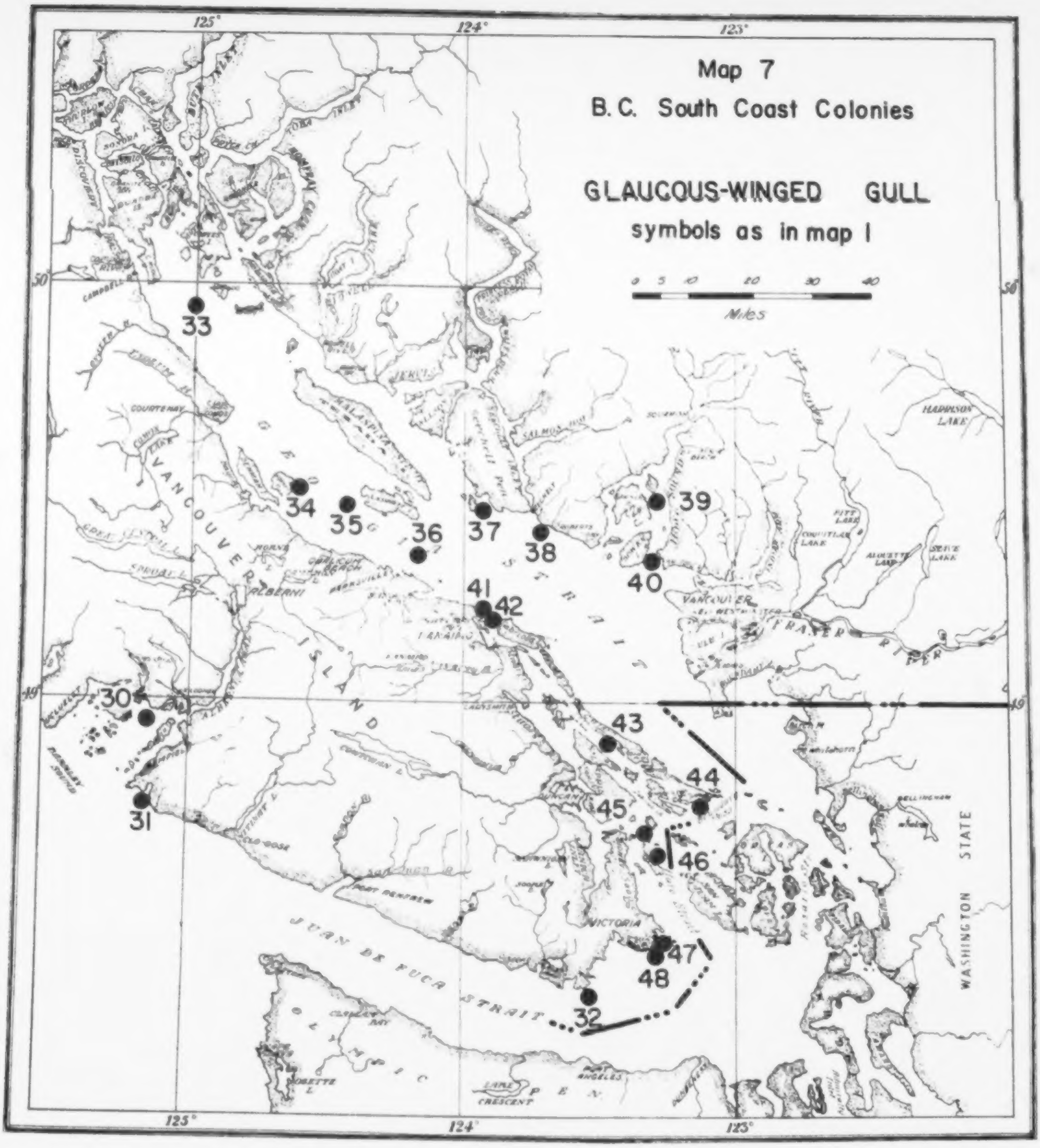
NESTING SITES OF THE GLAUCOUS-WINGED GULL
IN BRITISH COLUMBIA
Larus glaucescens
continued on Map 7

Map 7

(Latest year of definite nesting evidence given)

33.	Mitlenatch Island, Strait of Georgia	1960
34.	St. John Point, Hornby Island	?1960; 1946
35.	Sisters Islets, Strait of Georgia	1951
36.	Ballenas Island, Strait of Georgia	1956
37.	Franklin Rock & Merry Island, Welcome Pass	1960
38.	White Islets, Strait of Georgia S Wilson Creek	1958
39.	Christie Islet & Pam Rock, Howe Sound	1960
40.	Passage Island & rock to south, Howe Sound	1959
41.	Hudson Rocks & Five Finger Island, north of Departure Bay, Vancouver Island	1960
42.	Snake Island, Rainbow Channel	1960
43.	Ballingall Islets, Trincomali Channel	1959
44.	Java Islets, Boundary Pass	1960
45.	Imrie Island, Prevost Passage	1960
46.	Mandarte Island, Haro Strait	1960
47.	Chain Islets, off Oak Bay	1960
48.	Trial Island, S Oak Bay, V.I.	1960

N.B. San Juan Islands (U.S.A.) not covered.


Map 7
B.C. South Coast Colonies
GLAUCOUS-WINGED GULL
symbols as in map I
0 5 10 20 30 40
Miles
125°
124°
123°
50°
49°
VANCOUVER ISLAND
STRAIT
JUAN DE FUCA STRAIT
OLYMPIC PEN.
WASHINGTON STATE
VANCOUVER
FRASER RIVER
NANAIMO
ALBERNI
VICTORIA
PORT ANGELES
LAKE CRESCENT
PORT RENFREW
HARRISON LAKE
PITT LAKE
COQUITLAM LAKE
ALOUETTE LAKE
STAVE LAKE
CAMPBELL R.
COURTENAY
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48

MAP 7

NESTING SITES OF THE GLAUCOUS-WINGED GULL
IN BRITISH COLUMBIA (cont'd)
Larus glaucescens
South-coast colonies

NESTING SITE OF COMMON MURRE IN BRITISH COLUMBIA

Uria aalge

(No map; consult Pigeon Guillemot, Map 8)

Triangle Island, outermost of Scott Islands, the only authenticated colony; investigated 1949 (number 14 on map).

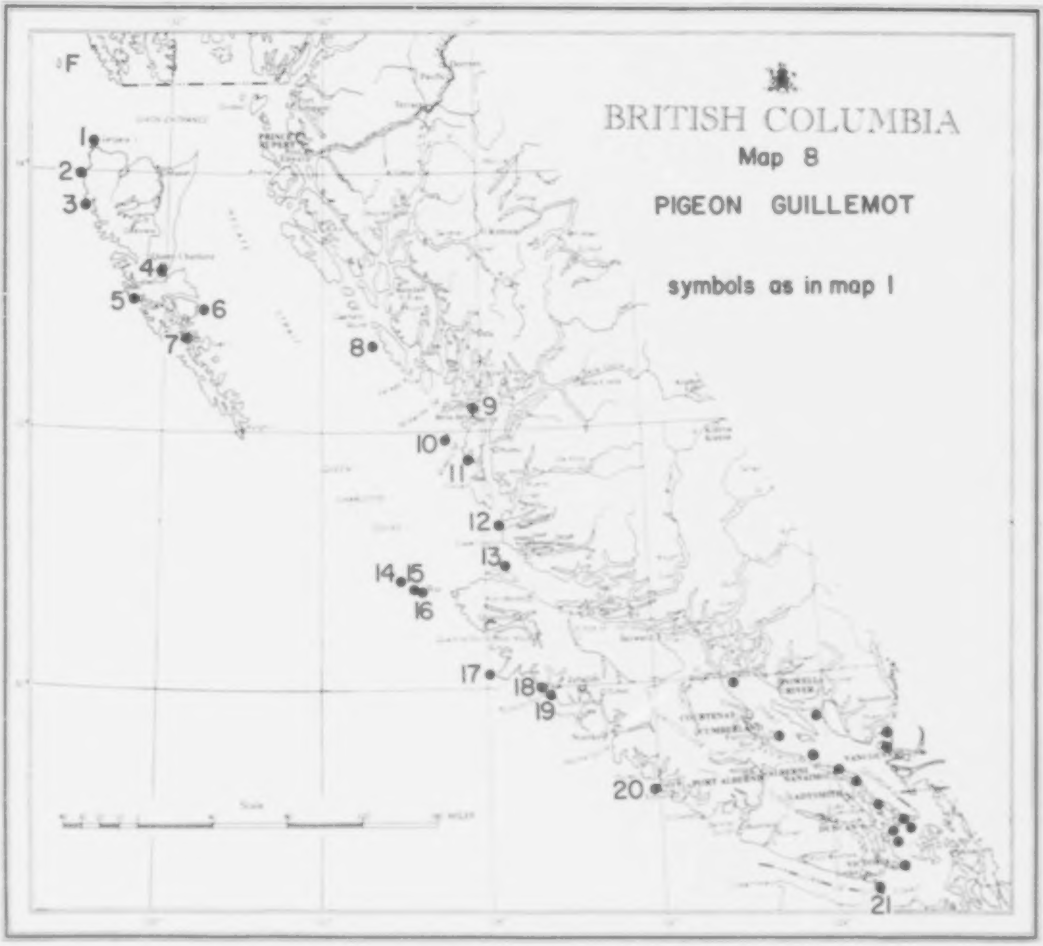
Cumming's Langara Island (number 1 on map) egg record (1 taken from oviduct) probably concerned a bird from the Forrester Island, Alaska, colony (indicated by F on map).

Map 8

(Latest year of definite nesting evidence given)

1.	Langara Island, QCI	1952
	and	
	Lucy Island, Solide Passage, QCI	1952
2.	Unnamed islet ("Grassy") between Morgan & White Points, west coast Graham Island, QCI	1947
	and	
	Frederick Island, QCI	1946
3.	Tian Islets, west coast Graham Island, QCI	1947
4.	Maple Island, Bearskin Bay	1946
5.	Helgesen Island, Boomchain Bay off Englefield Bay	1959
6.	Limestone Islands, S Skedans, QCI	1946
7.	Gil Islet, Darwin Sound	1946
8.	Moore Islands, Hecate Strait	1936
9.	Cooper Island, bay at Bella Bella	1959
10.	Goose Island group, Queen's Sound	1948
11.	Mosquito Islets, Kildidt Sound	1939
12.	Ann Island, Smith Sound	1937
13.	Pine Island, Queen Charlotte Strait	1929
14.	Triangle Island, Scott Islands	1949
15.	Sartine Island, Scott Islands	1950
16.	Beresford Island, Scott Islands	1950
17.	Solander Island, off Cape Cook	1954
18.	Amos Island, Mission Group, Kyuquot Sound	1957
19.	Clark Island, Barrier Group, Kyuquot Sound	1957
20.	Cleland Island, Clayoquot Sound	1930
21.	Race Rocks, Strait of Juan de Fuca	1959

(Remaining colonies numbered on following map, no. 9)


F
BRITISH COLUMBIA
Map 8
PIGEON GUILLEMOT
symbols as in map 1
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MAP 8

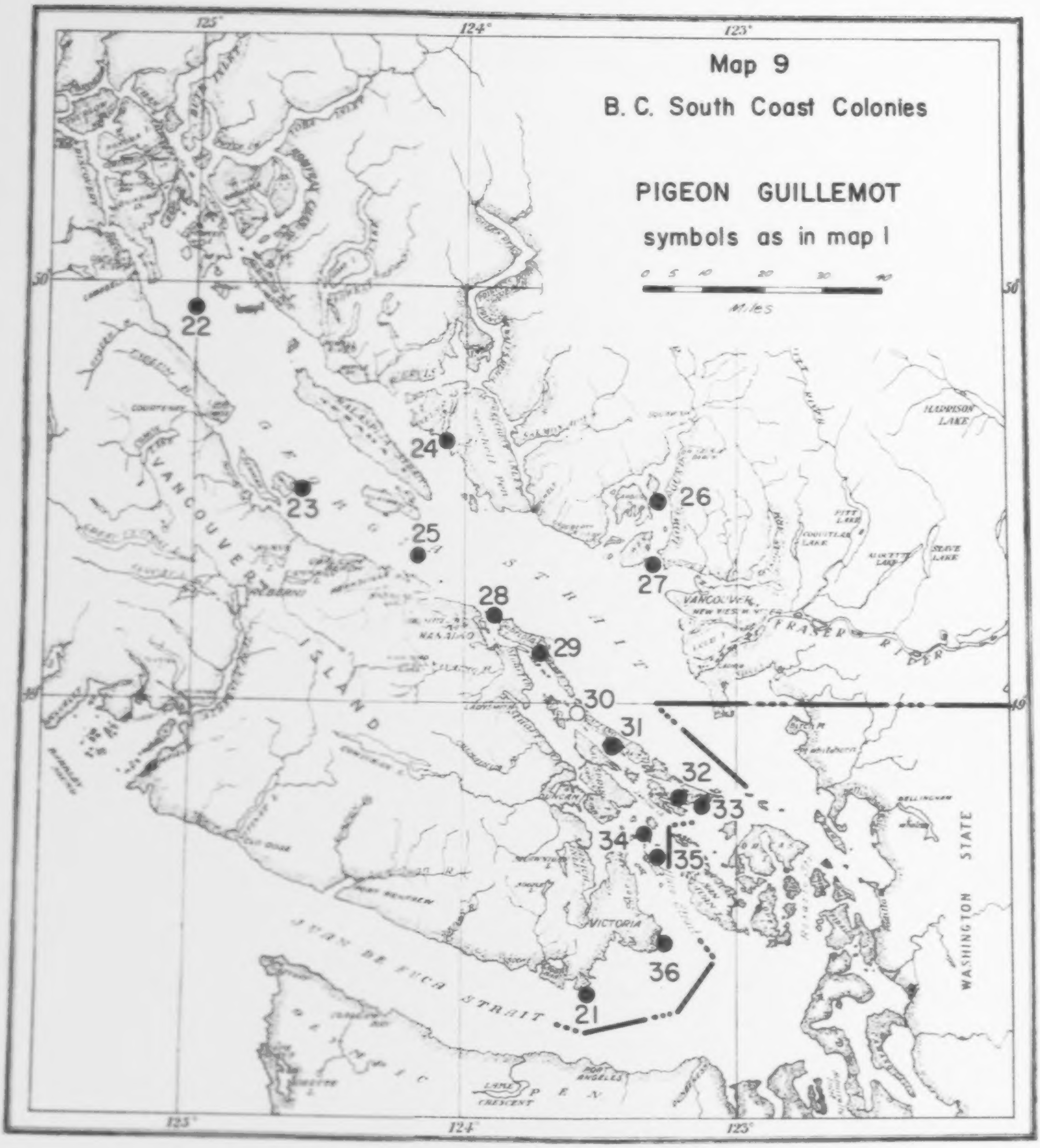
NESTING SITES OF THE PIGEON GUILLEMOT
IN BRITISH COLUMBIA
Cepphus grylle
continued on Map 9

Map 9

(Latest year of definite nesting evidence given)

22.	Mitlenatch Island, Strait of Georgia	1960
23.	St. John Point, Hornby Island	1957
24.	Daniel Point region, Sechelt Peninsula	1959
25.	Ballenas Island, Strait of Georgia	1956
26.	Christie Islet, Howe Sound	1959
27.	Batchelor Point cliffs, Howe Sound, and	1959
	Passage Island, Howe Sound	1959
28.	Snake Island, Rainbow Channel	1959
29.	NW shore of Valdes Island	1958
30.	Galiano Island, N Shaw' s Landing	1923
31.	Ballingall Islets, Trincomali Channel	1959
32.	Elliot Bluff, Saturna Island	1959
33.	Java Islets, Boundary Pass	1960
34.	Imrie Island, Prevost Passage	1960
35.	Mandarte Island, Haro Strait	1960
36.	Discovery Island, E Oak Bay and	1927
	Chain Islets, off Oak Bay	1960

N.B. San Juan Islands, U.S.A., not covered.


Map 9
B. C. South Coast Colonies
PIGEON GUILLEMOT
symbols as in map I
0 5 10 20 30 40
Miles
125°
124°
123°
50°
49°
22
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33
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35
36
21
VANCOUVER ISLAND
STRAIT
JUAN DE FUCA STRAIT
VICTORIA
NANAIMO
VANCOUVER
FRASER RIVER
HARRISON LAKE
WASHINGTON STATE

MAP 9

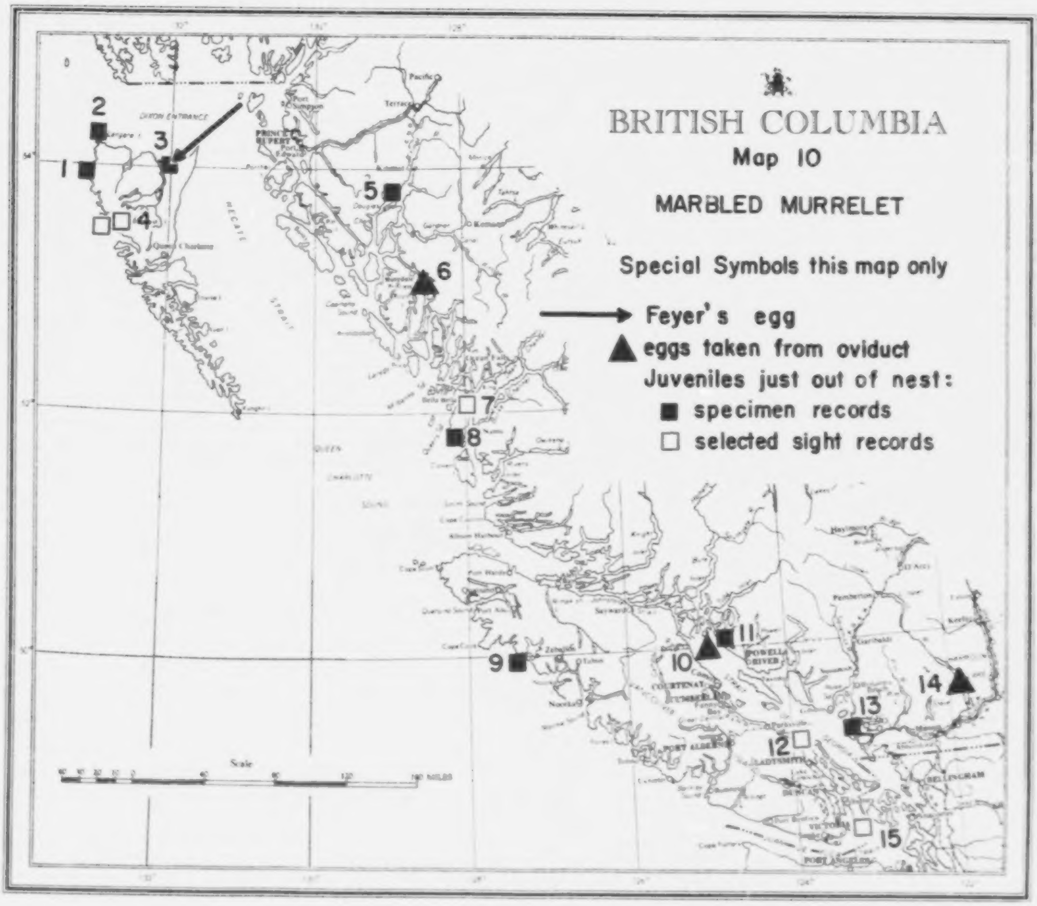
NESTING SITES OF THE PIGEON GUILLEMOT
IN BRITISH COLUMBIA (cont'd)
Cepphus grylle

Map 10

1. Peril Bay (juv. specimens, C. J. Guiguet)
2. Cloak Bay (juv. specimen, A. Brooks)
3. Masset (juv. specimen R. Stewart & Feyer's egg record)
4. Nesto Inlet to west, Tartu Inlet to east
   (2 sight records of juveniles, C. J. Guiguet)
5. Gilttoyees Inlet area (juv. specimen A. Brooks)
6. Swanson Bay (ova T. T. McCabe)
7. Higgins Pass (juv. sight records, C. J. Guiguet)
8. Spider Island (juv. specimen I. McT. Cowan)
9. Brown's Channel, Kyuquot Sound (juv. specimen C. J. Guiguet)
10. Off Mitlenatch Island (full-formed egg, Sutton & Semple)
11. Ragged Islands Pass (2 juv. specimens, T. T. McCabe)
12. Departure Bay (juv. sight records, M-C)
13. Pt. Grey, Vancouver (juv. specimen I. McT. Cowan)
14. Harrison Lake (ova, R. M. Stewart)
15. Victoria waters (numerous juv. sight records C. J. Guiguet)

N.B. sight records selections only to show entire coastline involved.

In addition, two published suspicions may be given: Sprot (1928) recorded finding an adult on the pavement of the Malahat Road August 4, 1927, apparently killed by a motor car; at this point the mountain slopes steeply into Saanich Inlet (NW Victoria, W Sidney). Darcus (1927 & in Young 1927) watched adults flying into the mountain slopes in the Tofino area (central west coast Vancouver Island).


BRITISH COLUMBIA
Map 10
MARBLED MURRELET
Special Symbols this map only
Feyer's egg
▲ eggs taken from oviduct
Juveniles just out of nest:
■ specimen records
☐ selected sight records
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13
14
15
PRINCE RUPERT
POWELL RIVER
COURTENAY
CUMBERLAND
PORT ALBERNI
LADYSMITH
DUNCAN
VICTORIA
PORT ANGELES
BELLINGHAM
Scale

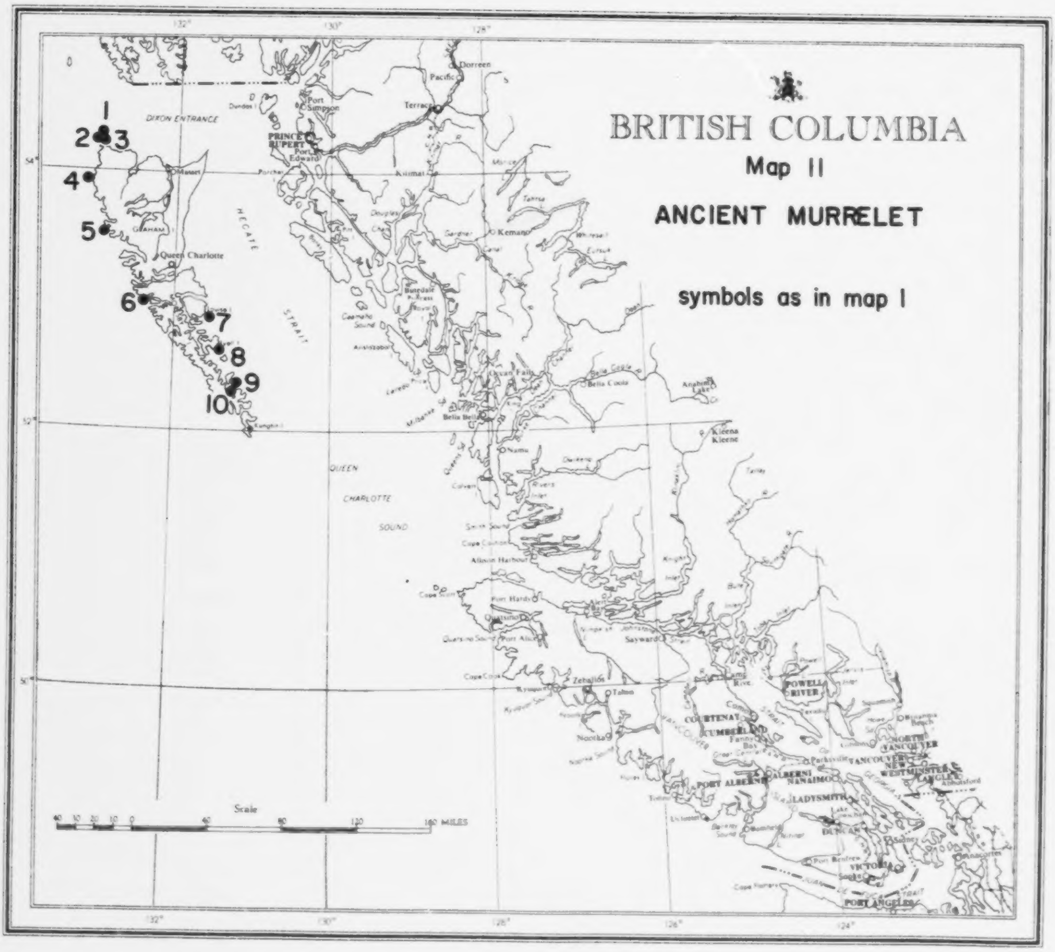
MAP 10

MARBLED MURRELET NESTING EVIDENCE IN BRITISH COLUMBIA
Brachyramphus marmoratum

Map 11

(Latest year of definite nesting evidence given)

1.	Langara Island, QCI	1960
2.	Cox Island, Claok Bay, QCI	1952
3.	Lucy Island, Solide Passage, QCI	1960
4.	Frederick Island, west coast Graham Island	1946
5.	Hippa Island, outside Nesto Inlet, QCI	1947
6.	Lihou, Helgesen, & Saunder Islands, Englefield Bay, QCI	1959/60
7.	Reef Island, SE Louise Island, QCI	1960
8.	Agglomerate Island, off SE tip Lyell Is.	1960
9.	George and East Copper Islands, Skincuttle Inlet, QCI	1960
10.	Boulder and Sea Pigeon Islands, entrance to Houston Inlet, QCI	1960


BRITISH COLUMBIA
Map 11
ANCIENT MURRELET
symbols as in map I
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DIXON ENTRANCE
HECATE
STRAIT
QUEEN
CHARLOTTE
SOUND
PRINCE RUPERT
Terrace
Kitimat
Kemano
Queen Charlotte
Masset
Bella Coola
Bella Bella
Port Hardy
Zeballos
Nootka
POWELL RIVER
COURTENAY
CUMBERLAND
PORT ALBERNI
NANAIMO
LADYSMITH
DUNCAN
VANCOUVER
NORTH VANCOUVER
NEW WESTMINSTER
VICTORIA
PORT ANGELES
Scale
MILES

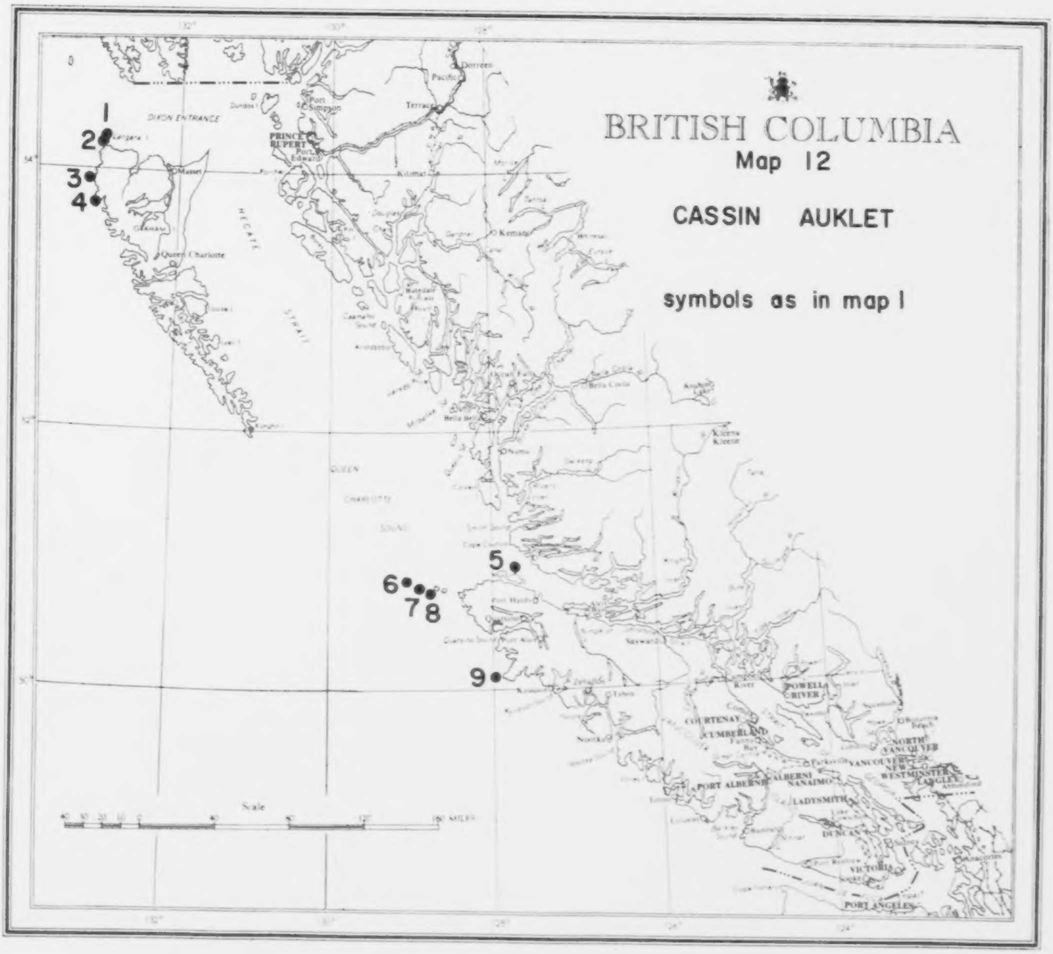
MAP 11

NESTING SITES OF THE ANCIENT MURRELET
IN BRITISH COLUMBIA
Synthliboramphus antiquum

Map 12

(Latest year of definite nesting evidence given)

1.	Langara Island, QCI	1947
2.	Cox Island, Cloak Bay, QCI	1952
3.	Frederick Island, west coast Graham Island	1946
4.	Tian Islets, central west coast Graham Island	1947
5.	Tree Islets, Queen Charlotte Strait,	1929
	and	
	Pine Island, Queen Charlotte Strait	1932
6.	Triangle Island, Scott Islands	1949
7.	Sartine Island, Scott Islands	1950
8.	Beresford Island, Scott Islands	1950
9.	Solander Island, off Cape Cook	1954


BRITISH COLUMBIA
Map 12
CASSIN AUKLET
symbols as in map I
1
2
3
4
5
6
7
8
9
DIXON ENTRANCE
PRINCE RUPERT
Masset
Queen Charlotte
HECATE STRAIT
QUEEN CHARLOTTE SOUND
Terrace
Kitimat
Bella Coola
POWELL RIVER
COURTENAY
CUMBERLAND
PORT ALBERNI
NANAIMO
LADYSMITH
DUNCAN
VANCOUVER
NORTH VANCOUVER
NEW WESTMINSTER
LANGLEY
VICTORIA
PORT ANGELES
Scale

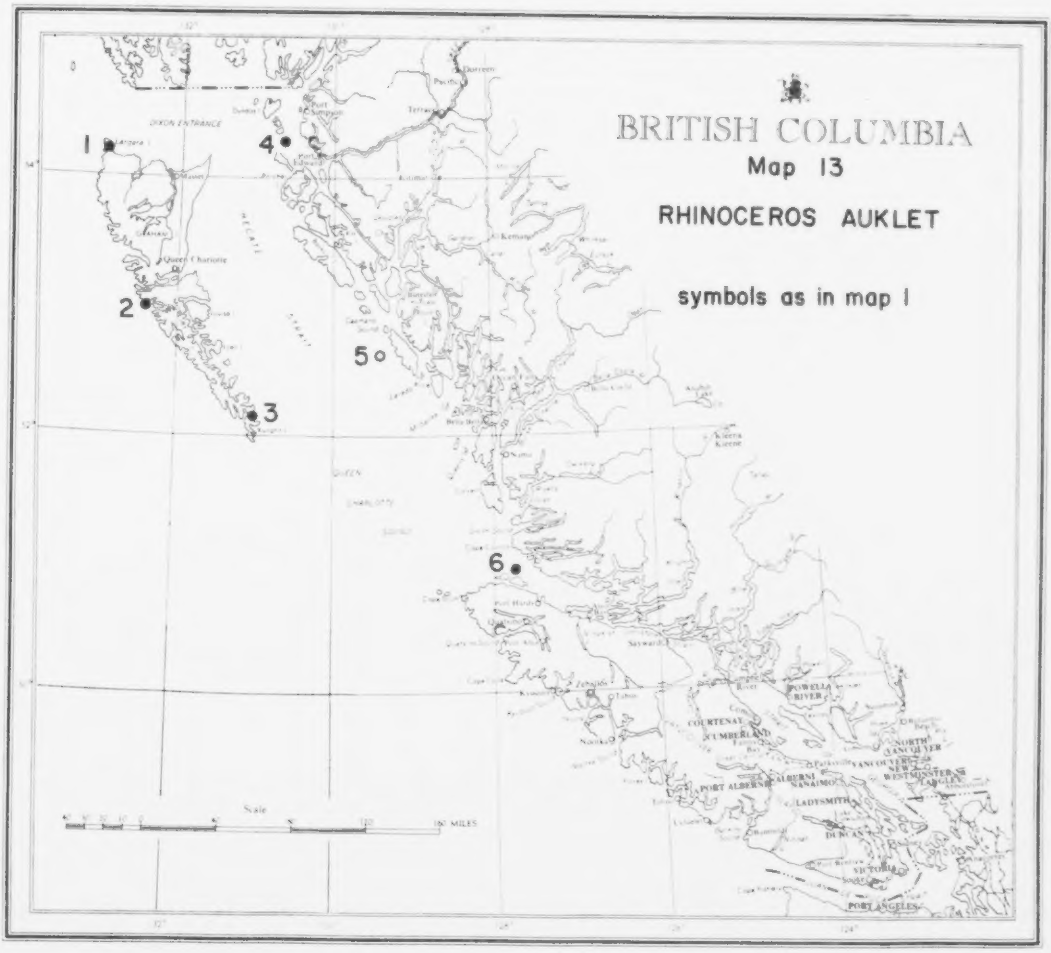
MAP 12

NESTING SITES OF CASSIN AUKLET IN BRITISH COLUMBIA
Ptychoramphus aleutica

Map 13

(Latest year of definite nesting evidence given)

1.	Langara Island, QCI	1952
2.	Helgesen Island, Boomchain Bay, QCI,	1959
	and	
	Lihou Island, Englefield Bay, QCI	1959
3.	Moore Head, on Kunghit Island, QCI	1946
4.	Lucy Island, Chatham Sound	1959
5.	N & SE Ganders, W Moore Islands	(1936)
6.	Pine Island, Queen Charlotte Strait	1929


BRITISH COLUMBIA
Map 13
RHINOCEROS AUKLET
symbols as in map 1
1
2
3
4
5
6
DIXON ENTRANCE
HECATE STRAIT
QUEEN CHARLOTTE SOUND
Queen Charlotte
Masset
Port Simpson
Terrace
COURTENAY
CUMBERLAND
POWELL RIVER
NORTH VANCOUVER
VANCOUVER
NEW WESTMINSTER
PORT ALBERNI
NANAIMO
LADYSMITH
DUNCAN
VICTORIA
PORT ANGELES
Scale
MILES

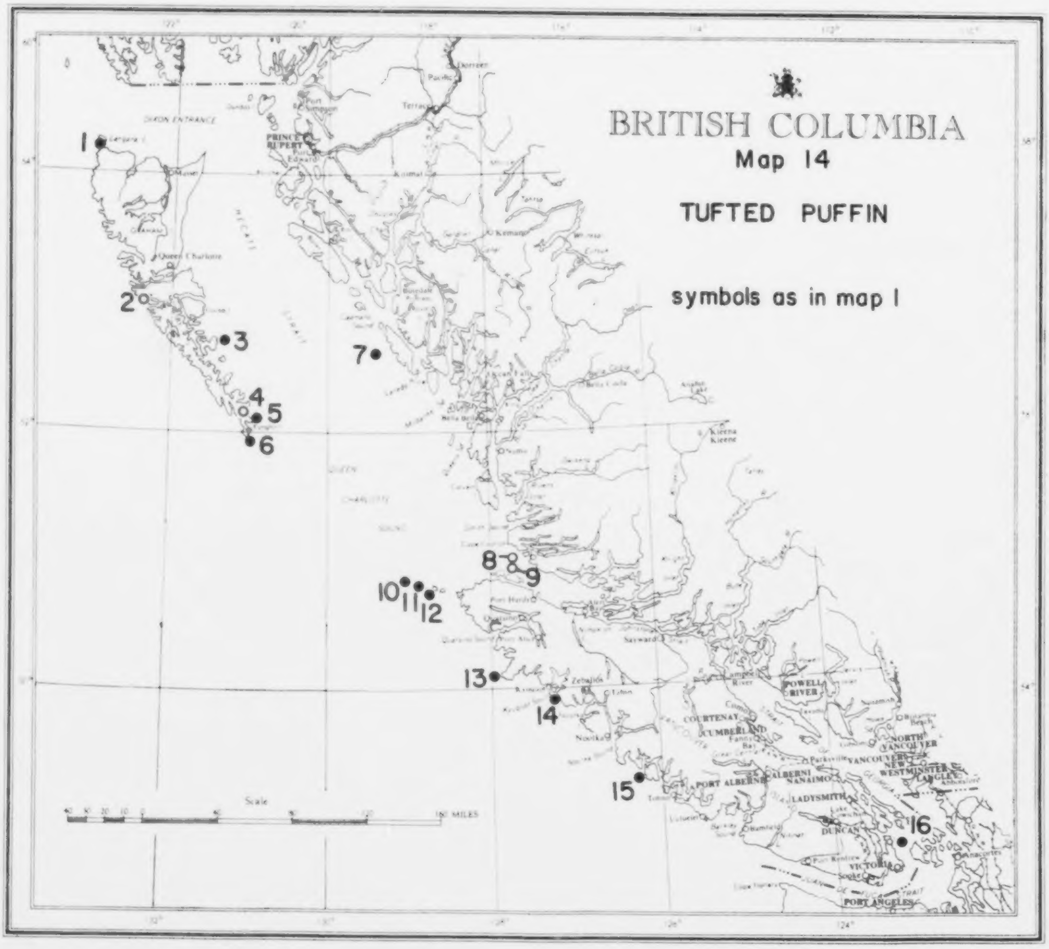
MAP 13

NESTING SITES OF THE RHINOCEROS AUKLET
IN BRITISH COLUMBIA
Cerorhinca monocerata

Map 14

(Latest year of definite nesting evidence given)

1.	Langara Island, QCI	1960
	and	
	Cox Island, Cloak Bay, QCI	1952
2.	Lihou & Helgesen Islands, Englefield Bay, QCI	1959
3.	Tuft Islets, E Lyell Island, QCI	1960
4.	Islet in Houston Stewart Channel	1900
5.	Lyman Point, Kunghit Island, QCI	1960
6.	Kerouard Islands, off Cape Saint James	1958
7.	N Ganders, west of Moore Islands	1936
8.	Storm Islands, Queen Charlotte Strait	1929
9.	Pine Island, Queen Charlotte Strait	1930
10.	Triangle Island, Scott Islands	1958
11.	Sartine Island, Scott Islands	1950
12.	Beresford Island, Scott Islands	1950
13.	Solander Island, off Cape Cook	1954
14.	Clark Island, Barrier Group, Kuyquot Sound	1958
15.	Cleland Island, Clayoquot Sound	1930
16.	Mandarte Island, Haro Strait	1960


BRITISH COLUMBIA
Map 14
TUFTED PUFFIN
symbols as in map 1
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
PRINCE RUPERT
DIXON ENTRANCE
HECATE STRAIT
QUEEN CHARLOTTE SOUND
Port Hardy
Zeballos
Tofino
Nootka
COURTENAY
CUMBERLAND
POWELL RIVER
PORT ALBERNI
NANAIMO
LADYSMITH
DUNCAN
VANCOUVER
NORTH VANCOUVER
NEW WESTMINSTER
LANGLEY
VICTORIA
PORT ANGELES
Scale
MILES

MAP 14

NESTING SITES OF THE TUFTED PUFFIN IN BRITISH COLUMBIA
Lunda cirrhata

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Work on a project of Dr. M.D.F. Udvardy, the mapping of the breeding ranges of all North American birds, first gave me the inspiration to carry this out in a detailed way for this Province, on the birds of my particular interest, the sea birds. Dr. Udvardy impressed upon me the need of careful documentation at every step, and for this initial training and encouragement I am indeed grateful. Dr. I. McT. Cowan enthusiastically supported the project, and gave me access to his valuable unpublished records (credited here as IMcTC MS) as well as those of the late Walter S. Maguire of New Westminster, whose outstanding oological collection is now housed in the Dept. of Zoology at U.B.C. (credited by WSM MS & WSM coll.). Maguire's records are particularly valuable since he accompanied C. J. Guiguet in fieldwork in the Queen Charlottes in 1947, and his collection contains tangible evidence for practically all records secured that season. Through Dr. Cowan access was also given me to the unpublished field notes of the late T. T. McCabe, providing valuable records for the central coast (credited as McCabe MS; Harvard deserves our gratitude for lending this important source material from the library at the Museum of Comparative Zoology). Dr. Cowan further put me in direct contact with C. J. Guiguet at the Provincial Museum at Victoria, and thus was our joint venture launched. In the final stages Dr. G. C. Carl, Director of that Museum, has made many practical suggestions on publication problems, and has further supplied many of the photographs from the Museum's files.

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No. 8. The Birds and Mammals of the Creston Region, British Columbia. J. A. Munro. 1950. 75 cents.

No. 9. A Natural History Survey of the Manning Park Area, British Columbia. G. Clifford Carl, C. J. Guiguet, and George A. Hardy. 1952. 75 cents.

No. 10. An Ecological Study of Goose Island, British Columbia, with Special Reference to Mammals and Birds. C. J. Guiguet. 1953. 75 cents.

No. 11. The European Starling in British Columbia: 1947–1957. M. T. Myres. 1958. 75 cents.

No. 12. A Catalogue of British Columbia Sea-bird Colonies. R. H. Drent and C. J. Guiguet. 1961. 75 cents.

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